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SCIENTIFIC AFFAIRS

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PROBLEMS IN CEMA MICROELECTRONIC COOPERATION NOTED

Busapest HIRADASTECHNIKA in Hungarian No 4, 1983 pp 160-164

[Article by Jan Grzybowski and Jerzy Kusinski, Polish People's Republic: "Several Problems of the Microelectronic Industry Cooperation of the CEMA Countries," after a speech given at the plenary session of the Third Microelectronics Conference of the CEMA Countries held in Siofok, May 1982]

[Text] In recent years the electronics industry has been the fastest growing sector of modern economic life. And this is understandable--around the world the level of development of electronics is both a stimulus to and precondition for economic development. It is worth noting that in the past three 5-year plan periods the sales volume for electronic products increased by an average of 30 percent while consumption of semiconductor parts increased by 100 percent. The integrated circuits industry developed even more strongly; the rate of growth here was 250-300 percent.

It is also easy to see that semiconductor parts in general--and especially integrated circuits--make up an ever greater value proportion in electronic equipment. At this time (according to data pertaining to the USA) this value proportion is about 7 percent; the figure extrapolated to the end of our decade is 12-15 percent.

This value proportion already exceeds 10 percent in Japanese electronic manufacturers are building in LSI parts on an ever greater scale.

In the case of special equipment, such as computer memories, the ICs [integrated circuits] make up 50 or even 80 percent of the entire value of the product.

In accordance with the above, the countries striving for swift economic growth are developing their electronics industries further, especially the research and manufacturing base for ICs.

But the indispensable conditions for success in this area are very precisely performed market surveys and a close check on research and manufacture, because the introduction of new products is not a swift process. It is easily possible that designing a complex new LSI circuit or introducing a new technological process could take so long that the manufacturing firm would lag behind as compared to demand. Developing new products or procedures is very expensive, so the manufacturer pays most dearly for every error made in planning.

What now characterizes the development and trends of products using LSI circuits?

Using the example of pocket calculators, we can observe the saturation of the market for specialized ICs, the subsequent drastic price reductions and--with the exception of the largest manufacturers in the USA and Japan--the disappearance of most firms from the market. The present trend is the development of larger-capacity calculators for scientific, economic, etc applications. It can also be established that universal microprocessor systems are spreading at the expense of the share of specialized computer ICs. Table 1 shows world production of pocket calculators and the value proportion of several types of parts in such devices.

Table 1: World Production of Pocket Calculators and the Value Proportion of Semiconductor Parts in These Products

	1975	1976	1977	1978	1980
Number of calculators (in millions)	42	50	52	53	58
Price of ICs (U.S. dollars)	2.75	1.90	1.30	1.15	0.95
Price of LED display (U.S. dollars)	2.25	1.40	1.00	0.80	0.70
Price of discrete parts (U.S. dollars)	0.25	0.20	0.20	0.15	0.12
Price of all semiconductor parts (U.S. dollars)	5.25	3.50	2.50	2.10	1.77
Total semiconductor market (millions of U.S. dollars)	220	175	130	110	103

The market for semiconductor memories is the most swiftly expanding area for use of LSI and VLSI circuits. This is favored by the standard structure of semiconductor memory segments, which makes possible a higher degree of integration, and the broad applicability of such circuits (among other things, in microprocessor systems used everywhere). At this time the proportion of MOS-RAM memories is the largest (50 percent) among semiconductor memories (taking the amount sold as the base). The trends of development are: increasing memory capacity, with simultaneous reduction of the price per cell unit. One can get 64-K dynamic RAMs on the market; preparations for manufacture of 256-K chips are under way and one counts on their production next year.

Electronic wristwatches provide another example of how large numbers of manufacturing firms disappear from the market with drastic price reductions. The manufacturers of wristwatches with LED displays did especially badly. About half of the watches manufactured around the world are electronic; liquid crystal circuits make up 90 percent of the value of these. The trend of development is to increase the number of functions (services) of electronic watches and to increase the use of microprocessor circuits. Table 2 shows the growth in the production of electronic watches and the development of their prices.

Table 2: Data Pertaining to the World Market for Electronic Watches

	1974	1976	1978	1980
Total production (millions)	1.2	15	60	100
Average price of electronic modules (U.S. dollars)	30	12	6	3
Total value of world production of modules (millions of U.S. dollars)	36	180	360	300
Average price of a watch (U.S. dollars)	125	55	35	25
World production of electronic watches (in millions of U.S. dollars)	150	825	2,100	2,500

Signal technology is increasingly becoming the largest consumer of ICs.

Electronicization of subscribers sets and telephone centers is spreading swiftly and this requires a large number of specialized ICs. Table 3 shows the trends of development in this area.

Table 3. Total Value of Signal Technology Semiconductor Parts Sold Worldwide (in millions of U.S. dollars)

	1974	1976	1978	1980
Bipolar ICs	70	100	200	370
Unipolar ICs	30	100	200	350
Discrete parts	80	140	150	160
Total	180	340	550	880

According to estimates the number of telephone sets in the world will reach one billion by the end of the century and this will result in a corresponding increase in the number of specialized signal technology circuits.

Another significant prospective consumer of electronic products is automobile manufacture. For some manufacturers the value proportion of electronic parts already reaches 12 percent of the price of the car, and is expected to increase to 16-18 percent by the end of the decade. Table 4 shows the growth of the automobile electronics market in the USA in recent years. This area of microelectronics applications is growing relatively slowly at present. Both technical and economic factors play a role in this. On the one hand electronic parts are still more expensive, in many cases, than the corresponding electromechanical or mechanical parts, and on the other hand the throughput time for planning in the automobile industry is very long.

Table 4. Development of the Automobile Industry Electronics Market in the USA

1975	1976	1977	1978	1979	1980	1982 (prognosis)
50	65	97	120	145	180	240

Despite this, according to the plans, these obstacles will be largely overcome in the second half of the present decade. Partly as a result of technical progress and partly because special, cheap microprocessors and reliable mechanical servomechanisms which can stand up even under the extra-ordinarily harsh operating conditions of automobile will spread.

The sales volume of electronic consumer goods is expected to remain large, but the structure of demand will change significantly. It can be foreseen that during the next 10 years ever larger numbers of multifunctional ICs will be built into electronic consumer goods and that the quality and economy of use of these circuits will improve substantially. A single chip will take care of more and more functions and fewer and fewer auxiliary parts will be needed.

Looking at the parts manufacturing industry as a whole, the following advantages will derive from planning which takes as a base multifunctional ICs (or microprocessors):

- the costs of designing new ICs and realizing new devices will decrease (for example, in the future they will use a total of 4 multifunctional chips in a color TV set in place of the present 11),
- new technical solutions can be optimized better, while series size increases,
- export can increase.

At this time there are two widespread IC manufacturing technologies, bipolar and unipolar. Table 5 shows the division of world IC production according to chief categories and technologies.

Comparing the various categories of MOS circuits, it appears that the swiftest growth was in the NMOS group (primarily due to memories and microprocessor circuits) and in the CMOS group (due to watches and calculators with liquid crystal displays).

The Schottky TTL (TTL-S and TTL-LS) circuits are very swiftly forcing out the TTL circuits, which previously constituted the most important group of bipolar digital circuits, because they are faster and require less power.

The digital MOS circuits have come up as compared to their bipolar corresponding circuits; they are smaller and the number of high-temperature steps needed in the course of manufacture is smaller, making them more suitable for LSI and VLSI technology.

According to the present position of technology, one can put on a single monolithic chip an LSI circuit containing more than 10,000 elements or a VLSI circuit containing 100,000 elements.

Designing and manufacturing such complex circuits means qualitatively new requirements in the areas of computerized design, testing (quality control), manufacture and investment.

Table 5. Division of World IC Production According to Technologies and Designs
(millions of U.S. dollars)

	1974	1975	1976	1977	1978	1979	1980
Bipolar digital ICs	985	740	905	1,065	1,210	1,305	1,420
of these TTL	720	540	680	810	930	1,005	1,115
DTL	115	85	90	75	70	65	60
ECL	70	60	80	95	110	120	135
Bipolar analog ICs	595	520	710	945	1,130	1,335	1,525
of these professional	335	310	390	550	675	810	915
consumer	260	210	320	395	455	525	610
Unipolar ICs	855	845	1,240	1,540	1,880	2,240	2,620
of these PMOS	660	585	680	645	600	535	510
NMOS	75	140	370	605	925	1,275	1,595
CMOS	120	120	190	290	355	430	515
Total sold in capitalist countries	2,435	2,105	2,855	3,550	4,220	4,870	5,500
Production in vertically integrated firms (capitalist)	400	440	580	705	835	980	1,170
Production of socialist countries	435	415	505	645	750	875	950
TOTAL	3,270	2,960	3,940	4,900	5,805	6,725	7,620

In the view of a number of semiconductor manufacturing firms in the USA and Japan the difficulties in introducing new VLSI chips can be expected primarily in design and secondarily in testing. They mention difficulties connected with development of technological procedures only in third place.

The degree of integration is highest for the memory chips; but they have a standard structure, with repeating cells. Design problems limit the development of other circuit groups with a less regular logical structure (for example, computer or microprocessor circuits). The development of complex VLSI circuits could be made easier if the irregular logical systems could be somehow "organized." Large functional blocks are also needed for libraries or data stores which could be stored in computer memory. Such blocks could be put together with the aid of layers bound into VLSI circuits.

If possible, all those difficulties facing the manufacturers of LSI and VLSI chips should be solved in cooperation with the manufacturers of complete electronic devices, although--as we will see--it may be that the latter will solve them.

One way to make substantial progress in increasing the degree of integration is to place the elements closer together on the chip. A precondition for this is the use of more precise (for example X-ray and electron radiation) lithographic methods. At this time one can call modern those photolithographic procedures which use a projection method with a resolution of 2-3 micrometers. Line structures finer than this can be attained with three new techniques:

- with an improved projection procedure, using remote ultraviolet radiation and quartz substrate masks (a line resolution of 1 micrometer);
- with controlled electron radiation equipment, in which the photoresist is exposed directly on the Si sheet (0.5-micrometer line resolution);
- with an intermediate technique, with operations performed directly on the Si sheet (1-2-micrometer line resolution).

Putting ever smaller units on the surface of the chips also requires the use of thinner and more finely structured layers. And this means that the technological operations must be done at lower temperatures and kept more precisely under control, using non-chemical etching procedures. Ion implantation is replacing the diffusion of doping components.

LSI and VLSI procedures taking the place of SSI and MSI manufacturing technologies have consumed initial investment costs, which increased by orders of magnitude. And as the initial investment costs of the semiconductor industry increase, the profit will be relatively smaller. This circumstance--which is a direct result of the microelectronic technology competition taking place around the world--has led to two phenomena:

1. So-called vertical integration is increasing, as a result of which firms which manufacture only semiconductors are dropping out of the competition while firms which manufacture both semiconductors and electronic equipment are developing. The profit from sale of equipment covers the costs of development of parts manufacture.
2. One can gear up semiconductor industries--or keep up with the leading world firms--only with state support. A number of VLSI circuit research programs in the countries leading in LSI and VLSI technology (the USA, Japan, England, France) were started with government support.

The present development of microelectronics around the world--and especially the entry of certain countries into the club of LSI and VLSI manufacturers--has created or made obvious a number of problems; everyone who wants to deal with the further development of microelectronics must reckon with these:

1. A swift increase in initial investment costs in the event of starting VLSI programs.
2. Vertical integration coming to the fore (uniting parts and equipment manufacture), for the following reasons:

- a. little firms cannot permit themselves the investment costs of VLSI programs,
- b. the large semiconductor manufacturing firms are beginning to manufacture complete equipment to produce a material base for their VLSI development,
- c. large firms manufacturing complete equipment are being forced to develop their own parts manufacture.

3. The differences between system design and VLSI chip design are disappearing.

4. The lack of an experienced work force, which seriously holds back VLSI development, and a relatively small group of experts being in possession of the know-how, which is guarded as a strict secret.

5. As an answer to the Japanese "challenge," the governments in many countries are "occupying" the semiconductor industry, while poorer countries are less and less able to finance competitive VLSI programs on their own.

With this background, what are the prospects for microelectronics in the CEMA countries?

According to information received from the several socialist countries the situation is as follows:

1. Soviet Union

In the Soviet Union in recent years great importance has been attributed to the development and modernization of electronics. In the majority of cases the trend being implemented is to manufacture microelectronic parts with its own equipment and from its own material according to its own standards, which do not always correspond to industrial world standards.

In our judgment the assortment of analog circuits which can be used in consumer articles is relatively tiny, although mass manufacture of calculators and watches has begun.

According to signed agreements, the Soviet Union and Poland will cooperate on a line of microprocessor circuits and Schottky TTL circuits and they will develop jointly an automated production line for manufacture of LSI and VLSI circuits.

2. GDR

The GDR manufactures both bipolar and MOS circuits. The assortment of MOS circuits is large enough, but they are primarily SSI and MSI circuits manufactured with MNOS technology. The GDR produces 8008 microprocessors in small quantities; it also plans development of a Z-80 system also.

3. Czechoslovakia

In Czechoslovakia standard circuits in the TTL family (also in cooperation with Poland) and analog circuits for both professional and consumer electronics

purposes are manufactured. It has proposed a vigorous development in the line of unipolar circuits. There is talk about circuits for an 8080 A microprocessor system, a series of 1 K RAM memories, 8 K EPROM and 16 K RAM memories and special circuits intended for use in consumer electronic devices. It is preparing to manufacture certain circuits for a bipolar 3000 microprocessor system.

4. Bulgaria

Thus far Bulgaria has not manufactured bipolar circuits; it has specialized in MOS circuits. Calculator, watch and memory circuits figure in the manufacturing spectrum. It plans the development of a microprocessor system--functionally equivalent to the Motorola 6800.

5. Hungary

According to our information, the MOS/LSI program is not yet beyond the laboratory research stage. At the same time, Hungary manufactures several dozen circuit types using imported chips.

6. Romania

The Romanian electronics industry has mastered production of TTL circuits and manufactures several types of analog circuits for use in consumer and professional equipment. According to our estimates, it cannot be expected that Romania will develop manufacture of MOS/LSI circuits in the near future.

7. Poland

According to the prescriptions of the Polish electronics industry development program, Poland will manufacture 70 million ICs (including LSI circuits) in 1985. According to the program the industry must master methods for design, manufacture and testing of VLSI-MOS circuits. The greatest pressure can be felt in the direction of design and manufacture of circuits for microprocessor systems.

Memories make up another important group of circuits. By 1985, according to the plans, it must develop and manufacture a basic series of semiconductor memories, from medium capacity to very large capacity. In the group of TTL logic circuits, the plan includes a series of fast, small-consumption TTL-S and TTL-LS Schottky diodes.

The plans for the group of calculator circuits include three chips for a programmable scientific calculator and an LCD chip in CMOS technology for an engineering calculator.

Several watch circuits will be developed, also in CMOS technology (analog watches, radio and TV clocks and a programmable digital clock).

In the consumer electronic products group, according to the plans, the CEMA countries will develop radio, TV, tape recorder, record player and amplifier circuits, in both bipolar and MOS technologies. As a result of the development

of TV sets expected by around 1985, they will manufacture integrated blocks for these receivers at the LSI level of integration.

Significant progress can be expected--in the areas of both development and manufacture--in a series of professional circuits (operation amplifiers, comparators, voltage regulators).

In the group of signal technology circuits they will manufacture primarily circuits for electronic telephone sets.

The IC circuit development and manufacturing program prescribed by the socialist countries as above, which can be called very broad, has a precondition for its realization not only the research and development base for the circuits themselves but also the assurance of the production of manufacturing and testing equipment, materials and semifinished products.

All of this together is much too difficult a task for a single country, so we must strive for international cooperation. It would be very desirable if the interested CEMA countries were able to come to agreement in regard to the division of labor for the development and manufacture of integrated (especially LSI and VLSI) circuits as soon as possible.

It would be useful, for example, to continue the present cooperation and extend it to microprocessor systems, namely:

in the Soviet and Czechoslovak relationship, to the 3000 system;
in the Soviet, Polish and Czechoslovak relationship, to the 8080 A, 8085 and 8048 systems;
for the GDR, to the 800 and Z-80 systems; and
in the Bulgarian and Soviet relationship, to the 6800 system.

A number of proposals for cooperation were voiced even at the first two Microelectronics Conferences, but very little of this has been realized. We are inclined to see the cause of this in the unfortunate fact that some scientific associations do not rely sufficiently on the findings and resolutions of the Dresden and Torun conferences, which would have provided a method and a foundation for the development of cooperation with the associations of friendly countries.

We consider valid in the present situation the statements made in 1978 and 1980 and the majority of the proposals voiced then pertaining to cooperation among associations.

Going beyond this, the Bulgarian colleagues recommend that the cooperation of the socialist countries in the field of microelectronics should figure as a permanent agenda point at the regular meetings of the presidents and secretaries of the scientific and technical associations of these countries.

According to the proposal of the HTE [Scientific Association of Telecommunications], the leading functionaries of CEMA should be invited to every microelectronics conference of the socialist countries. The Hungarian colleagues

also recommended that a list be prepared of those institutions which might exchange mutual visits and that permanent contact be established among groups of enterprises with similar production profiles. They see the chief obstacle to cooperation in the insufficient nature of the material frameworks.

If we examine the extent to which the conclusions of the preceding conferences have been realized, we get a most unfavorable picture. It can be established also that the degree of realization differs from country to country. If we draw the lessons from how the several associations participated in the preparatory work for the conferences and what their participation was at these conferences, right up to the recent past, we might question the usefulness of continuing the entire initiative. But in the course of the most recent Siofok conference a somewhat more favorable picture seemed to be developing.

After all this, with what method might we improve the efficiency of the realization of those resolutions passed by the most appropriate group?

For our part (speaking personally) we recommend the creation of a permanent inter-association committee, with 2-3 representatives per country, with the task of coordinating or initiating the microelectronics activity of the associations and, further, with the appropriate CEMA institutions, encouraging and supporting cooperation in the development of microelectronics in general in the socialist countries.

The starting point for the work of the committee might be the resolutions of the microelectronics conferences of the socialist countries. Cooperation also seems useful with the appropriate chambers for foreign trade, which in many cases have the material frameworks for support of various activities and for establishing economic, scientific and technical cooperation.

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INTERNATIONAL AFFAIRS

BRIEFS

INTERKOSMOS SYMPOSIUM--Within the framework of the Interkosmos Program, a session of the Work Group for the Long-Distance Exploration of the Earth opened in Prague on Tuesday. The symposium is attended by prominent scientists from the Soviet Union, the GDR, and Poland. Together with our experts, they will assess the problems connected with the development of equipment for the thermal representation of the earth's surface from planes and artificial satellites. [Text] [Prague RUDE PRAVO in Czech 7 Sep 83 p 2 AU]

MICROELECTRONICS CONFERENCE--the 3-day Third Czechoslovak Conference on Microelectronics with international participation, which opened in Bratislava yesterday, discusses the current scientific-technical problems of microelectronics and its application in practice. The more than 150 participants from Bulgaria, Yugoslavia, Hungary, the GDR, Poland, Romania, the USSR, and the CSSR will familiarize themselves in four sections with the latest findings in microelectronics. [Summary] [Bratislava PRAVDA in Slovak 7 Sep 83 p 2 AU]

NUCLEAR ELECTRONICS CONFERENCE--Current problems of nuclear electronics are the subject of an international conference that opened in Bratislava yesterday. The conference, which is organized by the Comenius University in Bratislava, the Nuclear Research Institute in Dubno near Moscow, and the Czechoslovak and Slovak Academies of Sciences, together with the Tesla enterprises in Piestany and Vrable, is attended by more than 180 experts from the CSSR, Bulgaria, Yugoslavia, Cuba, the DPRK, Hungary, the GDR, the FRG, Poland, Romania, Austria, Switzerland, Italy, the SRV, and the USSR. The week-long conference will deal, among other things, with spectrometrical electronics, with fast processors for the selection of information, and with the use of micro- and small computers in directing physical experiments. [Summary] [Bratislava PRAVDA in Slovak 7 Sep 83 p 2 AU]

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TECHNOLOGICAL INSTITUTE DIRECTOR VIEWS ARTIFICIAL INTELLIGENCE

Prague PRACE in Czech 16 Jul 83 p 4

[Interview with Docent Eng Ivan Plander, Drse, Director of Institute of Technical Cybernetics, by Eng Stefan Kassay, CSc, PhD: "Artificial Intelligence Comes to Life"; date and place not given]

[Text] The Institute of Technical Cybernetics in Bratislava is solving important problems of artificial intelligence. Since these problems are extremely interesting even for nonspecialists, I asked the institute's director, Docent Eng Ivan Plander, DSc, to deal with a wide range of questions.

[Question] Artificial intelligence is engaging the interest of both specialists and laymen. We have long since heard of the possibility of communicating with a computer by means of a special language such as ALGOL and others, but we have not heard much--or rather, we speak of it as science fiction--about the possibility of communicating with a computer in human language. How does this happen?

[Answer] Let me focus on the essential point. The older generation of computers was oriented toward the processing of digital information. Modern computers are oriented somewhat differently in order to make it possible to communicate with them in natural language or in the form of various graphs and images. Thus these are not digital computations, but scientific, technical or economic, computations: i.e., the use of computers in the more extensive work of society.

[Question] We frequently compare the human brain to the computer, or rather the computer to the brain. There is a clear difference in size, but what other fundamental differences are there?

[Answer] There are a good many fundamental differences. Many of them our science has not thus far been able to investigate. Nonetheless, we are attempting to design computers which are capable to some extent of simulating human thinking, and thus of understanding natural speech.

[Question] What is the advantage of communicating with a computer with the human voice or human speech?

[Answer] We have already mentioned the language ALGOL. There are other programming languages too, such as FORTRAN, COBOL AND PL/1: a whole constellation of them. But all of these languages must first be learned in order to use them. In addition, they are specially oriented toward specific use areas. But we want the computer to be usable by everyone in society, not just the chosen who have learned some programming language. Therefore, it is necessary to communicate in a natural language which everyone knows.

[Question] In describing computers we speak of generations: the first generation, let us say, of vacuum-tube computers, then the second, third, and even fifth generation. What awaits us in 20 or 30 years, when we will be relying on artificial intelligence?

[Answer] We are now on the threshold of the fourth generation, even in this country. Abroad, the fifth generation is already being prepared, and it is likely to be in operation in the early 1990's. These will be computers with a high degree of integration, in which on a single silicon wafer base, in a single package, on a single chip, there will be from 1 to 10 million components.

[Question] Perhaps we should add that this chip measures 3₀ to 5 millimeters.

[Answer] Yes, and sometimes even smaller. This small chip contains a huge number of functional elements. Another advantage is that the fifth-generation computer will already be able to use artificial intelligence in its programs. This is another qualitative aspect which differs from previous computers.

[Question] You have more in mind than miniaturization.

[Answer] This was a technological development. In the past, we classified computers in terms of the technological components used in them: tubes, transistors and integrated circuits. Now a new quality is added: artificial intelligence.

[Question] Let us return to the previous question, for you have not yet answered it fully; let us envision the future.

[Answer] Different designers have different plans and concepts. It is assumed that computers will directly reach the user, i.e., the individual member of society. Everyone will be capable of communicating with the computer or will have one at home. This is the first point. Second, everyone will have the possibility of communicating via telecommunications media with another, larger computer, with an information base where he can find out everything he needs for his work. Thus computers will permeate all of society.

[Question] Now tell us something about the automatic proving of mathematical theorems by means of machines.

[Answer] This is an interesting question, and it will not be simple to answer. I will try to do justice to one aspect of it, the use of the method of proving propositions (theorems) on the specific activities which will have to be carried out by intelligent robots in planning their activity. For the purpose of scheduling and planning the individual steps which they will have to perform (by the method of theorem proving), it is possible to create a procedural plan for the intelligent robot's activity. But as regards theorem-proving itself, I believe that those who work in mathematics and logic will be able to get into it better.

The principle of theorem-proving for planning the work robots, and, obviously, for the creation of specific intelligent systems as well (e.g., export, consultation, dialog and other systems), which can make an intelligent response to a question put to them, is that theorem-proving establishes the existence of a specific solution, and that a byproduct of this proof (and of the existence of a solution) is some sequence of operations for specific activities. A system (a computer or robot) will carry them out to reach out the goal whose existence was previously proven.

[Question] In the past, and indeed today, the work of the programmer has consisted of representing individual steps as algorithms. When we speak of intelligent machines, can we say that the machine itself converts the elements into algorithms?

[Answer] This is the essence of which I spoke, because previous computers and robots always performed precisely what the programmer had previously placed in their memory.

[Question] You visited Japan, where artificial intelligence is already being applied to industrial robots. What do you know about it?

[Answer] There is an interest in the intelligent robot connected to sensors, specific sense organs, like an eye, or visual subsystem, a tactile subsystem and a motor subsystem. Everything which a man has in himself is connected to the robot as an input device. This means that, figuratively speaking, the robot uses the sense organs to create an image of the external world within its memory. In addition, it operates only in terms of this image, using the theorem-proving method or certain other methods (for this is not the only method). There are many languages which lead to this objective. Then, based on its knowledge of the external environment, it is capable of proceeding like a traveler who plans his route on the map. First it says "I will go there, and then I will go on from there." The only difference is that the robot does not have a complete map, but must create it while en route. It then uses the map to plan subsequent steps. Perhaps a robot has to pass through a maze and get out of it; these methods are also used in such a case.

[Question] Not many people now conceive of the robot as an artificial man. The period during which this conception arose has passed. What does the intelligent robot which you saw in Japan look like, and how does it operate?

[Answer] There is no attempt to create an anthropomorphic robot in the true sense of the word. It is a mechanism which optimally performs certain activities, certain motions, but this activity is more of a scientific research activity. It focuses on simulation of the higher sentient activities of man, on cognitive activity.

[Question] And this is where the close relationship with theorem-proving comes in?

[Answer] Exactly: for a nonliving system to be able to move and to perform specific activities which are not programmed into it in advance, in step-by-step fashion (for it has only a specified objective), and, for it to know the environment in which it must achieve its goal. The environment may change dynamically, in time. It perceives this by its sensors, its sensing organs. On the basis of these, it creates its own solution, which may be completely different for a given objective--for different configurations, external settings and situations. This is not "normal" programming. These are not hereditarily encoded genetic information, so to speak. They are activities of another type and are not placed in man in advance.

[Question] What progress has been made worldwide in artificial intelligence; and where are we, what can we expect, and when?

[Answer] Many organizations in other countries are dealing with these questions. The results are very promising, but they are far from being results that could be generally used in social practice. I assume that the turning point will come in the early 1990's, when these facilities will enter social practice on an immense scale. As to a comparison with our level in Czechoslovakia, let us bear in mind that there is a need to engage in extremely intensive cooperation, and to begin as early as possible. We know that our couriers are not particularly fast, but we need to send them out in advance in order for them to reach the objective in time. We have done this. We know that we are not large. We do not have the material, financial and other capabilities which other countries have. But if we begin working on the solution in good time, we will be able to produce the results which our society needs. Accordingly, this year we set up an international base laboratory in the Institute of Technical Cybernetics. A good deal has already been said about this. Now we are expecting the first specific contacts abroad with regard to specific designs.

[Question] We should add that this will be the leading organization, which will primarily draw upon experience in the Soviet Union.

[Answer] Our colleagues and coworkers in the Soviet Union will be arriving this year from its leading organizations, which in the past have been working very intensively, particularly in the theoretical area. In this way we will add to our theoretical knowledge, while conversely our Soviet colleges will gain something practical and specific from us. We are creating mixed collectives which should be capable of rapidly finding suitable results.

[Question] Nowhere else, perhaps, has progress been as rapid as in electronics. Electronics has brought us more surprises than we could have foreseen in the boldest plans or in forecasts. New professions and new theories are arising--perhaps a theory of systems application. The profession of system engineer is a new one. What is the situation with regard to the architecture of fifth-generation computers?

[Answer] Computer architecture, like building architecture, is a specific structure and organization of computer systems as regards their external and internal construction. The architecture of a computer is in a certain respect dependent on capabilities. The architect of a computer system must design only what he has the conditions and capabilities for in terms of components, designs, accessories, peripherals. It is from these components that the entire structure of the computer is formed.

[Question] Just what is the fifth generation of computers?

[Answer] On the one hand, it stems from technology; we have said that it must be at a high level: a high level of integration, a million or 10 million transistors. The problem is that previous computer architecture, the classical von Neumann architecture (von Neumann was the father of the computer), is outdated and not capable of meeting the requirements which are imposed on future computers. This is particularly true in regard to speed, especially operation execution speed, because the current speed is about a million operations per second. To process tasks related to artificial intelligence, this speed is insufficient. A speed of tens of millions and even billions of operations per second is required. The conventional, classical architecture stemming from von Neumann is a sequential architecture, and will not be usable. Therefore, we are moving to new designs, new methods of laying out the internal structure and the organization of data and instruction flows.

[Question] Then this is architecture in a completely different sense from what we think of in daily life, the external architecture of buildings, but rather is internal architecture involving the byte layout, the layout architecture.

[Answer] In a building, we must know, as soon as we enter it through the main entrance, that we have reached the first floor, that we are coming to further rooms, and so on. This is just how it is realized, although in other categories, in a computer: it is very similar.

[Question] What will the fifth generation bring to human life?

[Answer] It will make it possible to use the computer for activities which were not previously carried out by a computer: we will communicate with it in natural language. We will have to give the computer sentences and words which need not be precise or have a specific syntactic layout. We will be able to speak at will, even in incorrectly formulated sentences. The computer must determine if there is an error, or if there is some insidious problem, and the like. All of this will be possible in such systems. For a system to be capable of conducting this dialog in real time, a million operations per second is far too few.

[Question] Would you try to give us an idea of your personal desire in this area? As a scientific worker and a director, you must have your work ambitions. What would you like to achieve or see in 10 or 15 years, let us say?

[Answer] I would like to see fifth-generation computers, extremely fast parallel computers, in operation, not in 10 years, but even sooner. We already have them on paper and in theoretical studies. Obviously this is not enough. We need to have these computers in operation, working, and of course producing, helping us with our economic and technical problems. We have worked out designs of this sort, and they are extremely interesting. When we speak of fifth-generation computers, there is another aspect, namely distributed computer systems, in which separate computers communicate with each other.

8480
CSO: 2402/60

GERMAN DEMOCRATIC REPUBLIC

SENSOR TECHNOLOGY FOR SECOND, THIRD GENERATION INDUSTRIAL ROBOTS

Optical Sensor Applications

Leipzig URANIA in German Vol 33 No 8, Aug 83 (signed to press 29 Jun 83)
pp 12-16

[Article by Dietmar Otto, graduate engineer: "More Effective Management With Industrial Robots"]

[Excerpts] Wherever in industrial countries better management and higher productivity are discussed today, industrial robots (IR) are in use to some degree. They make possible low-manpower production, a higher efficiency margin and--what especially counts for socialism--the dissolution of body-taxing, monotonous and health-endangering jobs. Since the Tenth SED Convention, the inventory of robots in our factories has increased by a factor of 3.4 percent; at the end of February 23,639 industrial robots were in service. Expressed in this are a good development and a healthy adjustment in the GDR to this new agency of automation although the manifold application of IR is to be further accelerated in order to fulfill this year's plan tasks and to attack 1984's tasks in a timely manner. Of special importance--and so decreed during the Sixth Meeting of the SED Central Committee--is the "multishift tasking of the available industrial robots in our economy and the associated release of manpower to do other jobs." Industrial robots take on special significance in rationalization projects wherein they are used with microelectronic systems to modernize available production facilities so "that highly productive technologies and processes with great economic effect can be made effective in the shortest possible time." Industrial robots of the next generations give us the potential to still more effectively structure the production processes. What can these industrial robots do, especially those of the next, the second generation?

From previous articles it is known that IR's can execute as often as required and with appropriate accuracy clearly describable geometric work processes and manipulative motions. In this class of motions are the loading and unloading of parts into or out of the machining enclosure of a machine tool or the execution of a specified tool motion as in grinding or deburring work. However in automating complicated production

process for the purpose of setting up automatic, low-manpower production in those areas where the human operator must skillfully use his senses, neither process-specific nor process-flexible IR's are satisfactory. Here robots with "intelligence" are required, industrial robots which possess sense organs (sensors) and brains (microcomputers).

Proximity Sensors

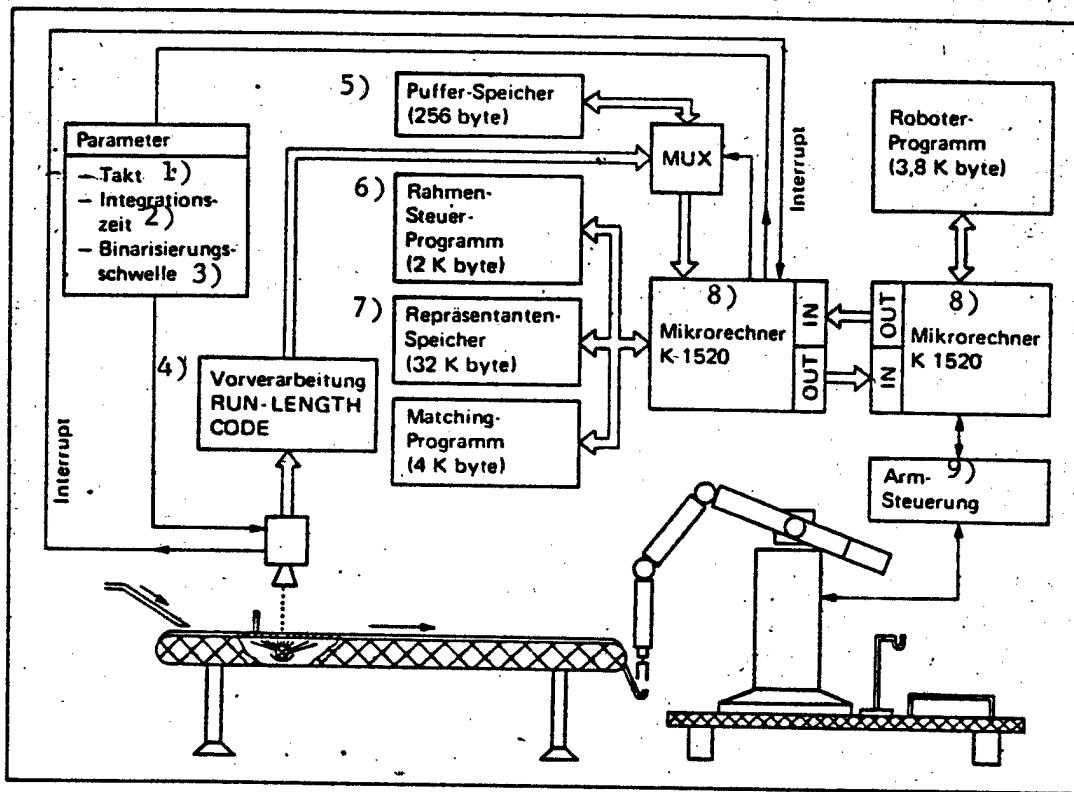
Proximity sensor systems respond to physical effects such as changes in capacitance, resistance, light intensity, sound waves, etc. The Central Institute for Welding Technology, Halle, has developed and put into production a number of effective sensors for the welding field. The photo shows a fillet-weld symmetry sensor which assures precise welding torch positioning during open-arc fillet welding. Its principle involves evaluation of the electromagnetic radiation which radiates from the arc during the welding process (evaluation of differences in light intensity). The reflection of the arc is, as the picture shows, picked up laterally on both sides by the flank plates being welded and the light intensity values are converted to electrical values via photo resistors. Two fiber optics cables enclosed in aperture tubes running alongside the torch are aimed at the area of the arc. The electrical conversion of the signals, evaluation and signal conditioning for guiding the axis of the torch take place in the sensor head.

Optical Sensors

Up to this point optical (visual) sensors are preferred among the proximity sensors due to their broad applicability. They are the distinguishing feature of IR's of the second generation. To some degree, one can make an analogy between IR optical systems and eye-brain coordination in human beings. The optical system determines the intelligence of the IR and hence its flexibility. Optical sensor systems have already been used in some areas for quite a while. Representative uses include processing of fluorographic pictures, automatic character recognition and the evaluation of satellite photographs. Conceivably, they can be used to solve many technical problems in the complex and flexible automation of processes. For photographing the IR field of view, both TV cameras and special cameras with lines or matrices of photosensitive elements can be used. The picture is read--raster scanned--in a form suitable for processing in the accompanying computer. The microcomputer processes this information in seconds in accordance with its stored programs for the purpose of flexibly controlling the IR. The IR has thus perceived and processed its environment. In the matrix solid state camera, for example, the sensor elements consist of a microelectronic component known as a charge coupled device on which several picture elements (pixels) can be carried along with signal preprocessing circuits. In the figure on page 14, video signals are represented schematically for line and matrix sensors. Internationally there is a broad selection of CCD cells (up to 2048 x 1 pixels) and of CCE matrices (up to 640 x 480 pixels). Visual systems can be assembled as 2-D, 2-1/2-D and 3-D systems. The most highly developed are 2-D systems (see URANIA 6/81).

The first CCD solid state cameras coupled with IR's were put into service in the GDR. An example is the line camera developed by the AdW of the GDR based on CCD line type L 110 with 256 x 1 pixels. It was coupled, for instance, with the PHM4 industrial robot from VEB Combine Robotron. This second-generation IR does assembly work in the precision equipment industry. A newer camera design variant has been developed in the VEB Combine Communications Technology, Studio Technology Division in Berlin. This type ZFK 1020 CCD line camera will be of importance in automating many processes. Two subsystems developed in connection with this program were a) the complete visual sensor system as a module to be inserted as a variant into the dismounted camera head and b) a circuit board in format K 1520. Utilization structures and examples can be seen in the graphics on p 17. It is a fact however that in the use of CCD line cameras for scene recognition a relative motion between camera and object is necessary for evaluating a planar picture.

Many questions are still open. There is however no doubt that industrial robots combined with microelectronics yield the most important agency for automating entire production segments. But we have to apply them objectively and have to objectively modernize, expand and reorganize technological processes and generalize technical innovations even faster than before. Above all, before introducing industrial robots in a new situation, the production organization has to be structured to interact with robots so that there will be no economic loss. Practical experience confirms the fact that not every robot has to possess the highest possible level of technical perfection with respect to its spectrum of application. This means: It only has to be able to do what the technological process requires. A smart combination of all automation media brings the highest effectiveness and productivity--the prerequisite for being able to successfully realize the economic strategy of the 1980s.



Structural schematic of the visual recognition system coupled with the PHM4 IR

Key to Figure:

1. clock	6. frame control program
2. integration time	7. reference image memory
3. binary encoding threshold	8. microcomputer
4. preprocessing run length code	9. arm controller
5. buffer memory	

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3. Schulze, K.R.; Farber, W.: "Sensors for Arc Welding Robots and Automats," ZIS Halle Vol. 139/1982.
4. Kempe, V.: "Sensors for Industrial Robots of the Second and Third Generations" Instrumentation, Guidance and Control Vol 2 (1983) pp 95-99

Current R & D Aims

East Berlin MESSEN-STEUERN-REGELN in German Vol 26 No 2, Feb 83 pp 95-99

[Article by Prof V. Kempe, Berlin, "Sensor Technique for Second and Third Generation Industrial Robots (Part II)"]

[Excerpt] The research and development work in the GDR in the field of sensor technology for industrial robots is characterized by three areas of focus:

--Adaptation of available sensors to various sample application cases for industrial robots of the second generation,

--development of new sensors and sensor systems (especially simple force sensors; RCC links; pneumatic, optical and infrared proximity sensors; visual recognition systems) and application within the scope of the sample application cases for robots of the second generation,

--sensor systems for industrial robots of the third generation including equipment and programming techniques for information processing and utilization; focus is on visual sensor systems.

An international research objective which is projecting more and more into the foreground is the conception and development of modular sensor building blocks with uniform design and electrical interfaces, standardized interface units and a modular programming system for information evaluation and derivation of control signals for the various control levels.

9160
CSO: 2302/4

POLAND

BIOGRAPHIES OF POLISH ACADEMY OF SCIENCE MEMBERS

Warsaw CZŁONKOWIE POLSKIEJ AKADEMII NAUK - INFORMATOR in Polish 1982 pp 5-151

[Text] Preface

This second edition of the "Członkowie Polskiej Akademii Nauk" [Members of the Polish Academy of Sciences] guidebook is appearing during the second year of the 11th term of the PAN [Polish Academy of Sciences] Presidium, encompassing the years 1981-1983. It takes into consideration the changes that have taken place during the past 3 years.

The guidebook includes a listing of the PAN members that have been elected to the PAN authorities during the current term, a brief biography and photograph of PAN members in Poland, concise data on foreign PAN members and a listing of deceased members in Poland and abroad.

The data on PAN members has been expanded in the current edition. Their biographies include the following data: first and last names, date of birth, date of admittance into PAN, participation in the work of the PAN Presidium, academic specialty, title and academic degrees, honorary doctorates, membership in foreign academies of sciences, honorary membership in scholarly associations, office-holding in international organizations, state prizes obtained, current place of work and position held and business and home addresses.

We are supplementing the previous data with the most indispensable general information: on the kinds of PAN membership, the method of adding to the PAN membership and the rights and duties of PAN members.

In accordance with the law on PAN that has been in effect since 1970, the academy is composed of regular and corresponding national members and foreign members. The regular and corresponding members have identical rights and duties, with the qualification that only a regular member may be elected president or vice president of PAN.

It should be added here that the first (1951) law on PAN stipulated two categories besides regular and corresponding members: honorary and titular members. Both of these categories, however, were dropped by a 1960 PAN law. No honorary members were ever appointed, and the 41 titular members that were included in the first PAN group in 1952 later were elected regular members.

The corporate nature of PAN as a self-governing association of scholars is based on the fact that new members are selected by current members. The code of regulations outlines the detailed procedure for nominating and electing PAN members. The most important change in this area, introduced in 1970, is the expansion of the circle of institutions authorized to nominate candidates to PAN. Before 1970, only academy members enjoyed that right, that was extended in 1970 to scientific councils of PAN branches, scientific-research institutes, scientific councils or the councils of the sections of organizational units of higher schools that have the authority to award doctor habilitatus degrees.

The PAN General Assembly elects all PAN members by secret ballot. Only a Polish citizen may be a national member of PAN. Only scholars that are not Polish citizens may be elected foreign members of PAN. The election of members by the PAN General Assembly is subject to confirmation by the Council of State.

The composition of the academy from 1954 (when the first elections of members were held) until 1981 was supplemented 30 times (elections of new national members were conducted 16 times and elections of foreign members were held 14 times). The policy of supplementing the make-up of the academy primarily was aimed at taking into consideration the criteria of scholarly excellence of candidates combined with the developmental needs of all national scholarly communities. In order to ensure that the various scholarly fields are represented properly, especially new, developing disciplines, the PAN Presidium determines how many new members may be elected during a given year and apportions places among the particular fields of knowledge. The Presidium publishes these decisions in the general and professional press.

Table 1. PAN Membership Figures as of 31 July 1982

<u>Sections</u>	<u>National Members</u>			<u>Foreign Members</u>
	<u>total</u>	<u>regular</u>	<u>corresponding</u>	
Total	295	161	134	114
Section I--Social Sciences	49	31	18	21
Section II--Biological Sciences	32	17	15	13
Section III--Mathematical, Chemical and Physical Sciences	66	33	33	26
Section IV--Technical Sciences	58	30	28	21
Section V--Agricultural and Forestry Sciences	31	18	13	13
Section VI--Medical Sciences	32	18	14	15
Section VII--Earth and Mining Sciences	27	14	13	5

Besides having the character of the highest scholarly distinction, election to PAN membership obliges one to take an active part both in research and in PAN organizational work.

The law in effect on PAN proclaims that the academy unites eminent scholars for the purpose of creative scholarly work and the execution of academy tasks and outlines more specifically the following duties of PAN members: national members of the academy are obliged to conduct scholarly work emanating from the plans of PAN or higher schools and other scientific-research institutions, to train new scholarly cadres, to take part in the work of the General Assembly, their own sections, branches, scholarly committees, institutional scholarly councils and commissions and to submit reports of their work to the appropriate PAN sections.

In recent years, the policy of the academy authorities has aimed toward creating for academy members the best conditions possible for scholarly work, toward making more and more extensive use of their knowledge, talent and experience and toward increasing their impact upon the creation of state academic policy and decisions on academic questions by entrusting to them the functions of organizing and creating national research programs.

This policy will continue to be practiced and strengthened in conformity with the operational program of PAN authorities. PAN is able to perform its numerous, difficult tasks only when its ranks contain the most eminent scholarly authorities; when it creates circumstances that enable the transformation of individual authorities and initiatives into group authorities and initiatives; when its members and collective organs will maintain unquestionable impartiality in assessing the situation and the needs of Polish scholarship, and its creative achievements and social work will gain for it respect and trust.

Authorities of the Polish Academy of Sciences for the 1981-1983 Term

PAN Presidium

President	regular member of PAN Aleksander GIEYSZTOR
Vice President	regular member of PAN Jan Karol KOSTRZEWSKI
Vice President	regular member of PAN Jerzy LITWINISZYN
Vice President	regular member of PAN Leonard SOSNOWSKI
Vice President	regular member of PAN Maciej WIEWIOROWSKI
Scientific Secretary	regular member of PAN Zdzislaw KACZMAREK
Members:	regular member of PAN Adam BIELANSKI
	corresponding member of PAN Mieczyslaw CHORAZY
	corresponding member of PAN Bohdan CISZEWSKI
	regular member of PAN Wladyslaw FISZDON
	regular member of PAN Waclaw GAJEWSKI
	regular member of PAN Kornel GIBINSKI
	regular member of PAN Janusz HAMAN
	corresponding member of PAN Alfred JAHN
	regular member of PAN Boguslawa JEZOWSKA-TRZEBIATOWSKA
	regular member of PAN Zofia KIELAN-JAWOROWSKA

regular member of PAN Stefan KIENIEWICZ
regular member of PAN Wlodzimierz KOLOS
regular member of PAN Gerard LABUDA
regular member of PAN Henryk MARKIEWICZ
regular member of PAN Wladyslaw MARKIEWICZ
corresponding member of PAN Alojzy MELICH
regular member of PAN Jan MICHALSKI
corresponding member of PAN Miroslaw MOSSAKOWSKI
corresponding member of PAN Witold NOWACKI
corresponding member of PAN Wlodzimierz OSTROWSKI
regular member of PAN Szczepan PIENIAZEK
regular member of PAN Henryk SZARSKI
regular member of PAN Roman TEISSEYRE
regular member of PAN Andrzej TRAUTMAN
corresponding member of PAN Adam Urbanek
regular member of PAN Wladyslaw WEGOREK
corresponding member of PAN Jozef WIECKOWSKI
regular member of PAN Stefan ZOLKIEWSKI

First Deputy
Scientific Secretary corresponding member of PAN Zbigniew GERTYCH

Deputy Scientific
Secretary regular member of PAN Maciej NALECZ

Section I--Social Sciences

Section Secretary regular member of PAN Wladyslaw MARKIEWICZ
Deputy Secretary corresponding member of PAN Henryk CHOLAJ
of the Section
Deputy Secretary Docent Doctor Leszek KUBICKI
of the Section

Section II--Biological Sciences

Section Secretary corresponding member of PAN Adam URBANEK
Deputy Secretary Prof Dr Kazimierz KLECZKOWSKI
of the Section
Deputy Secretary Prof Dr Przemyslaw TROJAN
of the Section

Section III--Mathematical, Physical and Chemical Sciences

Section Secretary regular member of PAN Wlodzimierz KOLOS
Deputy Secretary corresponding member of PAN Ryszard SOSNOWSKI
of the Section
Deputy Secretary Prof Dr Marian MIKOŁAJCZYK
of the Section

Section IV--Technical Sciences

Section Secretary	corresponding member of PAN Bohdan CISZEWSKI
Deputy Secretary of the Section	corresponding member of PAN Tadeusz SLIWINSKI
Deputy Secretary of the Section	Doc Dr Zenon SZODA

Section V--Agricultural and Forestry Sciences

Section Secretary	regular member of PAN Janusz HAMAN
Deputy Secretary of the Section	corresponding member of PAN Saturnin ZAWADZKI
Deputy Secretary of the Section	Prof Dr Franciszek WITCZAK

Section VI--Medical Sciences

Section Secretary	corresponding member of PAN Miroslaw KOSSAKOWSKI
Deputy Secretary of the Section	corresponding member of PAN Witold RUDOWSKI
Deputy Secretary of the Section	corresponding member of PAN Adam NOWOSLAWSKI

Section VII--Earth and Mining Sciences

Section Secretary	regular member of PAN Roman TEISSEYRE
Deputy Secretary of the Section	Prof Dr Boleslaw MALISZ
Deputy Secretary of the Section	Doc Dr Michal SZULCZEWSKI

Branches of the Polish Academy of Sciences

in Gdansk

President	corresponding member of PAN Jozef WIECKOWSKI
Vice President	corresponding member of PAN Tadeusz KRZYMOWSKI
Vice President	regular member of PAN Piotr ZAREMBA
Scientific Secretary	corresponding member of PAN Czeslaw DRUET
Deputy Scientific Secretary	corresponding member of PAN Wladzimierz PROSNAK

in Krakow

President	regular member of PAN Jerzy LITWINISZYN
Vice President	regular member of PAN Henryk SZARSKI
Scientific Secretary	corresponding member of PAN Wladzimierz OSTROWSKI
Deputy Scientific Secretary	corresponding member of PAN Antoni S. KLECKOWSKI
Deputy Scientific Secretary	corresponding member of PAN Emanuel ROSTWOROWSKI

in Katowice

President	corresponding member of PAN Alojzy MELICH
Vice President	regular member of PAN Tadeusz ZAGAJEWSKI
Scientific Secretary	corresponding member of PAN Waclaw SAKWA
Deputy Scientific Secretary	corresponding member of PAN Henryk BYSTRON

in Lodz

President	regular member of PAN Jan MICHALSKI
Vice President	regular member of PAN Edward ROSSET
Scientific Secretary	corresponding member of PAN Zygmunt LASOCKI
Deputy Scientific Secretary	Prof Dr Andrzej NADOLSKI

in Poznan

President	regular member of PAN Wladyslaw WEGOREK
Vice President	regular member of PAN Jerzy PAWELKIEWICZ
Scientific Secretary	corresponding member of PAN Witold MICHALKIEWICZ
Deputy Scientific Secretary	corresponding member of PAN Jan STANKOWSKI

in Wroclaw

President	regular member of PAN Boguslawa JEZOWSKA-TRZEBIATOWSKA
Vice President	regular member of PAN Hugon KOWARZYK
Scientific Secretary	corresponding member of PAN Ludwik BADIAN
Deputy Scientific Secretary	regular member PAN Bohdan STALINSKI

NATIONAL MEMBERS

Section I--Social Sciences

Regular Members

Henryk BARYCZ, born 26 June 1901
regular member 1973
history of culture
retired full professor, Jagiellonian University in Krakow, Dr of Philosophy
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foreign member of: Bologna Adam Mickiewicz Academy of Polish and Slavic
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Mieczyslaw BRAHMER, born 26 January 1899
corresponding member 1958, regular member 1964
Romance language studies, history of the theater
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1961-1964
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Dr h.c.: University of Bratislava
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European Academy of History, Institute of France (Acad. d'Inscriptions et
Belles-Lettres), Belgian Royal Academy, Belgian Royal Academy of Science,
Literature and Fine Arts, Bordeaux National Academy of Science, Literature
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honorary member of: Plock Scientific Society
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prehistorical archeology and archeology of the early Middle Ages
foreign member of: GDR Academy of Sciences, Macedonian Academy of Sciences
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Archeological Societies
International Committee for Studying City Origins, president 1962-1978;
International Committee of Slavists, vice president 1971--; International
Union for Slavic Archeology (IUAS), president 1965-1967, vice president 1968--
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Dr h.c.: University of Budapest, UJ Krakow, University of Lodz, University
of Moscow, Wroclaw University, WSE [Higher School of Economics] Wroclaw
foreign member of: Academy of Sciences of the Mongolian People's Republic,
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Czechoslovakian Academy of Sciences, Mexican Academy of History
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chairman, PAN branch in Poznan 1972-1980
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foreign member: GDR Academy of Sciences
state awards: individual; third degree 1949, 1951, group; first degree 1970
director, PAN Institute of History Board on the History of Pomorze,
Zwierzyniecka Street No 20, 60-814 Poznan, telephone 4-44-55
[address] Kanclerska Street No 8, 60-327 Poznan

Manfred LACHS, born 21 April 1914
corresponding member 1960, regular member 1973
international law
full professor Warsaw University, Dr of Jurisprudence (UJ), Dr (University
of Nancy), Dr of Legal Studies (M[ihail] Lomonosov Moscow State University)
Dr h.c.: University of Algiers, University of Brussels, University of Budapest,
Univ. of Bucharest, Univ. of Delhi, Univ. of Halifax, Univ. of Helsinki,
Univ. of London, Univ. of Nice, New York University, Univ. of Sofia,
Univ. of Southampton, Univ. of Simon Fraser in Vancouver, Howard Univ.,
Washington D.C.
member of: International Academy of Astronauts, Paris (honorary)
foreign member of: Bologna Academy of Ethical Studies, Academy of Ethical
and Political Studies of the Institute of France, Hague Academy of International
Law, Mexican Academy of International Law
honorary member of: American Society of International Law in Washington,
Indian Society of International Law
Academy of International Law, vice president 1976--; Legal Committee, UN
General Assembly, chairman 1949, 1951, 1953; Legal Committee on Cosmic Space
of the UN, chairman 1962-1967; Council of the UN Research Institute,

vice president 1977-1980; International Tribunal of Justice, president 1973-1976, judge in the International Court of Justice, the Hague
[address] Cour Internationale de Justice, Palais de la Paix, La Haye, Holland

Edward LIPINSKI, born 18 October 1888
titular member 1952, regular member 1957
political economics
retired full professor, Main School of Planning and Statistics [SGPiS], Warsaw
and Warsaw University
Dr h.c.: SGPiS, Warsaw
foreign member of: British Academy
honorary president of: Polish Economic Society [PTE], International Society
for Economics Studies (IEA)
state awards: individual; second degree 1955; individual; first degree 1972
[address] Rakowiecka Street, No 22c, apt 26, 02-521 Warsaw

Stanislaw LORENTZ, born 28 April 1899
corresponding member 1952, regular member 1964
history of modern art
retired full professor, Warsaw University, Dr of Philosophy
Dr h.c.: Univ. of Bordeaux, Univ. of Nancy
foreign member of: Venice Academy of Fine Arts, National Academy of Science,
Literature and the Arts, Bordeaux
honorary president of: International Center of Studies for the Preservation
and Restoration of Cultural Monuments in Rome
honorary member of: Art Historians Society, International Committee for Art
History (CIHA), International Museums Council (ICOM), International Council
on Historic Monuments and Historic Districts (ICOMOS)
International Center for Research in the Field of the Preservation and
Restoration of Historic Monuments in Rome, vice president 1958-1964, president
1965-1971
state awards: group; second degree 1952, 1955, individual; first degree 1964,
Special Award 1979
director of the National Museum in Warsaw, Jerozolimski Blvd. No 3, 00-495
Warsaw, telephone 21-81-95
[address] Jerozolimski Blvd. No 3, 00-495 Warsaw

Henryk LOWMIANSKI, born 10 August 1898
corresponding member 1952, regular member 1956
history of the peoples of the USSR, medieval studies
retired full professor, Adam Mickiewicz University in Poznan, Dr of Philosophy
Dr h.c.: Univ. of Poznan, Warsaw University
state awards: individual; first degree 1955, 1964
[address] Czesnikowska Street No 12, apt 1, 60-330 Poznan

Henryk MARKIEWICZ, born 16 November 1922
corresponding member 1965, regular member 1976, member, PAN Presidium 1981--
history of Polish literature, literary theory
full professor, Dr of Polish Studies
state award: group; second degree 1951
director, UJ Institute of Polish Studies, Krakow, Golebia Street No 20, 31-007
Krakow, telephone 22-10-33, extension 343
[address] Artur Grottger Street No 1, apt 6, 30-035 Krakow

Wladyslaw MARKIEWICZ, born 2 January 1920
corresponding member 1971, regular member 1976; member, PAN Presidium and
secretary, Section I--Social Sciences, PAN 1972--; Palace of Culture and
Science, 00-901 Warsaw, telephone 20-33-52
sociology
full professor, Dr of Humanistic Studies
Institute of Sociology, Warsaw University, Karowa Street 18, 00-324 Warsaw
telephone 27-85-99
[address] Wiejska Street No 18, apt 13, 00-490 Warsaw

Edward ROSSET, born 4 November 1897
corresponding member 1962, regular member 1976; vice president of the Lodz
PAN branch 1978--; Boczna Street No 5, 90-362 Lodz, telephone 4-16-00
demography and statistics
retired full professor, Lodz University, Dr of Jurisprudence
Dr h.c.: Univ of Lodz
honorary member of: W. Ketrzynski Center for Scientific Studies in Olsztyn,
Polish Gerontological Society, Polish Free University Society, Czechoslovakian
Demographic Society, Italian Committee for Population Problem Research
European Center for Population Research (CEEP), vice president 1971-1976
state award: individual; first degree 1976
[address] Aleksander Zelwerowicz Street No 34, 90-147 Lodz

Jan SAFAREWICZ, born 8 February 1904
corresponding member 1958, regular member 1964
Indo-European linguistics
retired full professor, UJ in Krakow, Dr of Philosophy
Dr h.c.: Univ of Wilno
[address] Wladyslaw Lokietek Street No 1, apt 1, 30-010 Krakow

Adam SCHAFF, born 10 March 1913
corresponding member 1952, regular member 1961; member, PAN Presidium 1960-
1968
philosophy
full professor, Dr of Philosophical Studies
Dr h.c.: Univ of Ann Arbor [as published], the Sorbonne, Paris
foreign member of: Bulgarian Academy of Sciences
state awards: individual; second degree 1951; individual; first degree 1955,
1964
head, Institute on Theory of Knowledge, PAN Institute of Philosophy and
Sociology, Staszic Palace, Nowy Swiat Street No 72, 00-330 Warsaw, telephone
26-52-31 extension 165
honorary professor of: Univ of Vienna
chairman, Council of Directors, European Center for Social Sciences in Vienna
[address] First Army of the Polish Army Blvd, No 2/4 apt 24, 00-582 Warsaw

Kazimierz SECOMSKI, born 26 November 1910
corresponding member 1960, regular member 1966; member, PAN Presidium 1969-
1980, deputy scientific secretary, PAN 1969-1971
planning and socioeconomic policy
retired full professor, SGPiS, Dr of Economic Sciences
Dr h.c.: Warsaw Univ, WSE Poznan
foreign member of: Czechoslovakian Academy of Sciences
state awards: individual; second degree 1970, individual; first degree 1974
deputy chairman, Council of State
[address] Tadeusz Boy Zelenski Street No 6, 00-621 Warsaw

Stefania SKWARCZYNSKA, born 17 November 1902
corresponding member 1971, regular member 1976
theory of literature, theater and film
retired full professor, Lodz University, Dr of Philosophy
Dr h.c.: Lodz University
honorary chairperson of: Slavic Poetics and Stylistics Commission, Inter-
national Committee of Slavists
[address] Gabriel Narutowicz Street No 79 apt 18, 90-138 Lodz

Franciszek SLAWSKI, born 13 May 1916
corresponding member 1969, regular member 1980
South Slavic linguistics
full professor, Dr of Philosophy
foreign member of: Austrian Academy of Sciences, Bulgarian Academy of Sciences
director, Slavic Studies Institute, UJ Krakow, Adam Mickiewicz Blvd No 9/11,
31-120 Krakow, telephone 33-63-77 extension 309
[address] Jan Kochanowski Street No 11 apt 13, 31-127 Krakow-

Wiktor STEFFEN, born 27 September 1903
corresponding member 1967, regular member 1976
classical studies
retired full professor, Adam Mickiewicz Univ in Poznan, Dr of Philosophy
Dr h.c.: Univ of Wroclaw
honorary member of: Polish Philological Society
[address] Wieslawa Street No 13, 61-053 Poznan

Bogdan SUCHODOLSKI, born 27 December 1903
corresponding member 1952, regular member 1964; member, PAN Presidium 1969-
1980, deputy scientific secretary, PAN 1966-1968
general pedagogy
retired full professor, Warsaw University and PAN Institute of History, Science
and Education, Dr of Philosophy
Dr h.c.: Slask Univ, Katowice
foreign member of: Academy of the History of Learning, Paris
honorary member of: European Society of Comparative Pedagogy, International
(World) Society of Pedagogical Sciences
European Society of Comparative Pedagogy (CESE), vice president 1964-1971;
International (World) Society of Pedagogical Sciences (AISE), president 1969-
1973 and organizer of AISE Congress in Warsaw 1969; International Academy

of History of Learning (AIHS), vice president 1968-1971; World Federation for
Futurist Studies (WFSF), vice president 1977--
state award: individual; second degree 1964
[address] Smiala Street No 63a, 01-526 Warsaw

Jerzy SZABLOWSKI, born 30 January 1906
corresponding member 1967, regular member 1980
history of art
full professor, Dr of Art History
honorary member of: Art Historians Association, Society for the Care of
Historic Monuments
state awards: group; second degree 1955, individual; first degree 1964
director, Wawel State Art Collections, Krakow, telephone 22-19-50
[address] Wladyslaw Syrokomla Street No 19a art 4, 30-102 Krakow

Jan SZCZEPANSKI, born 14 September 1913
corresponding member 1964, regular member 1969; member PAN Presidium 1969-1980,
vice president, PAN 1972-1980
sociology
full professor, Dr of Philosophy
Dr h.c.: Univ of Brno, Univ of Lodz, Sorbonne Univ, Paris, Warsaw University
foreign member of: American Academy of Exact and Humanistic Sciences
(honorary), Finnish Academy of Science and Literature, National Academy of
Pedagogy, United States
honorary member of: Czechoslovakian Sociological Society, Soviet Sociological
Society
International Sociological Association (AIS), president 1966-1970
state award: individual; first degree 1974
PAN Institute of Philosophy and Sociology, Nowy Swiat Street No 72, 00-330
Warsaw, telephone 26-71-81
chairman, PRL [Polish People's Republic] Sejm Scioeconomic Council
[address] Mokotowska Street No 46a apt 23, 00-453 Warsaw

Waclaw SZUBERT, born 19 September 1912
regular member 1976
labor law, social policy
full professor, Dr of Jurisprudence
member of: International Academy of Comparative Law
director, Labor Law Chair, Faculty of Law and Administration, Lodz Univ,
Gabriel Narutowicz Street No 59a, 90-131 Lodz, telephone 8-85-10 extension 298
[address] Spalska Street No 3 apt 9, 02-934 Warsaw

Jerzy TOPOLSKI, born 20 September 1928
corresponding member 1971, regular member 1976
economic history, historical methodology
full professor, Dr of Humanistic Studies
state awards: individual; second degree 1970, group; first degree 1978
director, Institute of History, Adam Mickiewicz Univ in Poznan and director,
Institute of Polish History Through the 18th Century and the Historical
Methodology Laboratory, Julian Marchlewski Street No 124/126, 61-874 Poznan,
telephone 5-22-03
[address] Pawel Wlodkowic Street No 10 apt 1, 60-334 Poznan

Wladyslaw WOLTER, born 5 February 1897

regular member 1967

penal law

retired full professor UJ in Krakow, Dr of Jurisprudence

honorary president, Polish Society of Forensic Medicine and Criminology,

Krakow branch, honorary member, Society of Law Libraries and Students, UJ

[address] Gontyn Street No 6, apt 4, 30-203 Krakow

Stefan ZOLKIEWSKI, born 9 December 1911

corresponding member 1952, regular member 1961; member, PAN Presidium 1952-1968, 1981--, secretary, Section I--Social Sciences, PAN 1952-1953, 1960-1968, scientific secretary, PAN 1953-1955

literary theory

full professor, Dr of Philological Studies

state award: group; second degree 1951, individual; second degree 1953, 1964
director, Institute of Knowledge on Literary Culture, PAN Institute of Literary Research, Nowy Swiat Street No 72, 00-330 Warsaw, telephone 26-52-31 extension 73

[address] Blvd of Roses No 6 apt 14, 00-556 Warsaw

Corresponding Members

Jan BIALOSTOCKI, born 14 August 1921

corresponding member 1976

general art history

Dr h.c.: Univ of Groningen

foreign member of: Mainz Academy of Science and Literature, San Fernando Academy of Fine Arts in Madrid, Bavarian Academy of Sciences, Royal Academy of Science, Literature and Fine Arts of Belgium, Royal Dutch Academy of the Arts and Sciences, Saxon Academy of Sciences

International Committee on Art History (CIHA), vice president 1969--, International Council for Philosophy and Humanistic Studies (CIFS), vice president 1978--

state award: individual; first degree 1978

director, Modern Art History Institute, Warsaw University Art Institute, Krakowskie Przedmiescie No 26/28, 00-325 Warsaw, telephone 26-15-74

curator, Foreign Art Gallery, National Museum in Warsaw, Jerozolimski Blvd No 3, 00-495 Warsaw, telephone 21-10-31 extension 91

[address] Dluga Street No 32/34 apt 7, 00-238 Warsaw

Henryk CHOLAJ, born 1 January 1927

corresponding member 1973; member PAN Presidium 1975-1980, deputy secretary, Section I--Social Sciences, PAN 1972--; Palace of Culture and Science, 00-901 Warsaw, telephone 20-33-65

political economics

full professor, Dr of Economics Studies

director, Production Economics Chair, Political Economics Faculty, SGPIs, Niepodleglosc Blvd No 162, 02-554 Warsaw, telephone 49-12-51 extension 167

[address] Julian Brun Street No 34 apt 53, 02-594 Warsaw

Marek FRITZHAND, born 12 October 1913

corresponding member 1973

ethics

full professor, Dr of Philosophy

head, Ethics Institute, Philosophy Institute, Warsaw University, Krakowskie Przedmiescie No 3, 00-047 Warsaw, telephone 26-43-88

[address] Wyzwolenie Blvd No 2 apt 3, 00-570 Warsaw

Mieczyslaw KLIMOWICZ, born 14 December 1919

corresponding member 1976

history of Polish literature and theater

full professor, Dr of Humanistic Studies

Institute of Polish Philology, Wroclaw University named for Boleslaw Bierut, Nankier Place No 15, 50-140 Wroclaw, telephone 40-25-76

[address] Lwowska Street No 75 apt 5, 53-420 Wroclaw

Antonina KLOSKOWSKA, born 7 November 1919

corresponding member

sociology of culture

full professor, Dr of Philosophy

director, Sociology of Culture Institute, Warsaw Univ, Karowa Street No 18, 00-324 Warsaw, telephone 20-03-81 extension 720

[address] Dzika Street No 6 apt 270, 00-172 Warsaw

Witold KULA, born 18 April 1916

corresponding member 1979

economic history

full professor, Dr of Humanistic Studies

Dr h.c.: Univ of Besancon

International Association for Economic History (AIHE), vice president 1965-1968, president 1968-1970, honorary president 1970--; International Association of Metrological History (AIHPM), vice president 1975--

Warsaw Univ Institute for Economic Studies, Dluga Street No 44/50, 00-241 Warsaw, telephone 31-44-06

[address] Paryska Komuna Place No 4 apt 58, 01-626 Warsaw

Czeslaw KUPISIEWICZ, born 13 August 1924

corresponding member 1976

general teaching methodology

director, Didactic Systems Workshop, Pedagogy Institute of Warsaw Univ, Szturmowa Street No 1, 02-678 Warsaw, telephone 43-66-50

[address] Smiala Street No 44b, 01-526 Warsaw

Boguslaw LESNODORSKI, born 27 May 1914

corresponding member 1973

history of the Polish state and law

full professor, Dr of Jurisprudence

Dr h.c.: Univ of Toulouse

state awards: individual; third degree 1951, group; second degree 1952

Institute of Legal History, Warsaw Univ, Krakowskie Przedmiescie No 26/28, 00-325 Warsaw, telephone 20-03-81 extension 399

[address] Kredytowa Street No 8 apt 20, 00-062

Czeslaw MADAJCZYK, born 27 May 1921
corresponding member 1979
contemporary history
full professor, Dr of Historical Studies
International Committee on the History of World War II, vice president 1980--
state award: individual; second degree 1972
director, PAN Institute of History, Rynek Starego Miasta No 29/31, 00-272
Warsaw, telephone 31-36-42
[address] Nowiniarska Street No 1 apt 11, 00-235 Warsaw

Alojzy MELICH, born 7 June 1918
corresponding member 1971; member, PAN Presidium 1975--, chairman, PAN branch
in Katowice 1975--; Graniczna Street 32, 40-018 Katowice, telephone 57-12-39
theory and policy of employment and wages
full professor, Dr of Economics Studies
Dr h.c.: Univ of Halle
director, Institute of Political Economy, Karol Adamiecki Economics Academy
in Katowice, Bogucicka Street No 3, 40-226 Katowice, telephone 58-68-44
[address] Drozdow Street No 11, 40-538 Katowice-Brynow

Stefan NOWAKOWSKI, born 6 August 1912
corresponding member 1971
rural and urban sociology, sociology of the nation
full professor, Dr of Sociology
director, Rural and Urban Sociology Institute, Warsaw Univ Sociology Institute,
Karowa Street No 18, 00-324 Warsaw, telephone 20-03-81 extension 702
[address] Sady Zoliborskie No 5 apt 4, 01-772 Warsaw

Wincenty OKON, born 22 January 1914
corresponding member 1973
pedagogy, theory of education
full professor, Dr of Philosophy
Dr h.c.: Higher Pedagogical School, Krakow
International Society for Research on the Socialization of Youth, president
1977--
director, Chair of Teaching Methodology, Pedagogical Faculty, Warsaw Univ,
Szturmowa Street No 1, 02-678 Warsaw, telephone 47-02-73

Kazimierz OPALEK, born 13 August 1918
corresponding member 1976
political science, theory of the state and the law
full professor, Dr of Legal Studies
Dr. h.c.: Univ of Pecs
member of: International Academy for the History of Learning
director, Institute for State and Legal Theory, Political Science Institute,
UJ, Stanislaw Ziaja Street No 5, 31-114 Krakow, telephone 22-50-89
[address] Mazowiecka Street No 2 apt 3, 30-036 Krakow

Jozef PAJESTKA, born 9 March 1924
corresponding member 1973
socioeconomic development, economic process direction
full professor, Dr of Economic Sciences
director, PAN Institute for Economic Sciences, Palace of Culture and Science,
00-901 Warsaw, telephone 20-02-11, extension 40-89
[address] Aleksander Sulkiewicz Street No 7 apt 12, 00-758 Warsaw

Emanuel ROSTWOROWSKI, born 8 January 1923
corresponding member, 1979; deputy scientific secretary, Krakow PAN branch
1981--, Slawkowska Street No 17, 31-016 Krakow, telephone 22-48-53
Polish and general 18th century history, biographistics
full professor, Dr of Philosophy
director, PAN Institute of History "Polish Biographical Dictionary" Institute,
Slawkowska Street No 17, 31-016 Krakow, telephone 22-29-61
[address] Gontyna Street No 10, 30-203 Krakow

Wieslaw SADOWSKI, born 2 January 1922
corresponding member 1969
econometrics
full professor, Dr of Economic Sciences
SGPiS Institute of Econometrics in Warsaw, telephone 49-12-51 extension 154
president, Central Office of Statistics [GUS], Niepodleglosc Blvd No 208,
02-555 Warsaw, telephone 25-22-15
[address] Na Skarpie Blvd No 19 apt 3, 00-488 Warsaw

Margaret SCHLAUCH, born 25 September 1898
corresponding member 1960
English studies
retired full professor, Warsaw University, Dr of Philosophy
[address] Brzozowa Street No 10, apt 12, 00-286 Warsaw

Sylwester ZAWADZKI, born 19 October 1921
corresponding member 1976
constitutional law, state and legal theory
full professor, Dr of Juridical Studies
Dr h.c.: Univ of Wroclaw
Warsaw University Institute for Studies on the State and the Law, Krakowskie
Przedmiescie No 26/28, 00-325 Warsaw, telephone 20-03-81, extension 397
minister of justice, Ujazdowski Street No 11, 00-567 Warsaw, telephone 28-73-68
[address] Wiejska Street No 18 apt 9, 00-490 Warsaw

Section II--Biological Sciences

Regular Members

Tadeusz BARANOWSKI, born 13 September 1910
corresponding member 1954, regular member 1969, member, PAN Presidium 1966--
1974
physiological chemistry
retired full professor, Medical Academy in Wroclaw, Dr of Medical Studies
foreign member of: Leopoldin German Academy of Natural Sciences
state awards: individual second degree 1952, group; first degree 1964
[address] Szarotkowa Street No 6, 51-250 Wroclaw

Stefan BIALOBOK, born 11 May 1909
regular member 1976
genetics of arborescent plants
retired full professor, PAN Institute of Dendrology, Dr of Exact Sciences
International Dendrological Society (IDS), vice president 1968--
[address] Parkowa Street No 3, 63-120 Kornik near Poznan

Irena CHMIELEWSKA, born 13 July 1905
corresponding member 1964, regular member 1973; member, PAN Presidium 1972--
1974
biochemistry
retired full professor, Warsaw University, Dr of Chemistry
honorary member of: Polish Biochemical Society
state award: individual; third degree 1951
[address] Rakowiecka Street No 22 apt 16, Blvd E, 02-517 Warsaw

Zygmunt EWY, born 27 April 1913
corresponding member, 1969, regular member 1976
animal physiology
full professor, Dr of Physiology
honorary member of: Polish Physiological Society, Polish Society of Veterinary
Sciences
director, Institute of Applied Animal Physiology, Agricultural Academy in
Krakow, Adam Mickiewicz Blvd No 21, 31-120 Krakow, telephone 33-38-24
[address] Ambrozy Grabowski Street No 5 apt 3, 31-126 Krakow

Waclaw GAJEWSKI, born 28 February 1911
corresponding member 1958, regular member 1969; member, PAN Presidium 1981--
genetics
retired full professor, Warsaw University and PAN Institute of Biochemistry
and Biophysics, Dr of Biological Sciences
state awards: individual; first degree 1976
[address] Miaczynska Street No 54 apt 58, 02-637 Warsaw

Franciszek GORSKI, born 6 August 1897
corresponding member 1962, regular member 1969
plant physiology
retired full professor UJ in Krakow, Dr of Philosophy
Dr h.c.: Agricultural Academy [AR] Krakow
[address] Zygmunt Krasinski Blvd No 14, 30-061 Krakow

Zygmunt GRODZINSKI, born 24 April 1896
corresponding member 1956, regular member 1961
animal (vertebrate) morphology from ultra- to macrostructures, primarily the circulatory system and the vitellus
retired full professor, UJ in Krakow, Dr of Philosophy
Dr h.c.: Univ of Torun
honorary member of: Polish Naturalists' Society named for Mikolaj Kopernik, Polish Anatomical Society, Polish Zoological Society
state award: individual; second degree 1955
[address] Feliks Dzierzynski Street No 9a apt 8, 30-046 Krakow

Zofia KIELAN-JAWROWSKA, born 25 April 1925
corresponding member 1967, regular member 1973; PAN Presidium member 1972--
paleontology
full professor, Dr of Biological Sciences
honorary member of: Polish Naturalists' Society named for Mikolaj Kopernik, U.S. Society for Vertebrate Paleontology
International Union for Geological Studies (IUGS), vice president 1980--;
1980 International Geological Congress, vice president
state award: individual; second degree 1974
director, PAN Paleobiology Institute, Zwirka and Wigura Streets No 93, 02-089 Warsaw, telephone 22-16-52
[address] Bonifacy Street 141, 02-909 Warsaw

Wladyslaw KUNICKI-GOLDFINGER, born 13 February 1916
corresponding member 1965, regular member 1980
microbiology, genetics, theoretical biology
full professor, Dr of Mathematical-Natural Sciences
state award: individual; third degree 1955
Warsaw University Institute of Microbiology, Nowy Swiat Street 67, 00-046 Warsaw, telephone 26-89-82
[address] Leopold Staff Street No 107, 01-884 Warsaw

Wlodzimierz MICHAJLOW, born 24 March 1905
corresponding member 1960; regular member 1966; member, PAN Presidium 1963-1980.
secretary, Section II--Biological Sciences, PAN 1969-1974
parasitology
retired full professor, PAN Parasitology Institute, Dr of Biological Sciences
Dr h.c.: Poznan AM [Medical Academy]
honorary member: League for the Preservation of Wildlife, Polish Naturalists' Society named for Mikolaj Kopernik, Czechoslovakian Parasitological Society, All-Soviet Society of Helminthologists of the USSR
International Congress of Parasitology ICOPA IV, president 1974-1978
state awards: individual; second degree 1955, 1964
director, PAN University, Nowy Swiat Street No 72, 00-330 Warsaw, telephone 26-52-31, extension 23
[address] Stanislaw Noakowski [as published] Street No 14, 00-666 Warsaw

Włodzimerz NIEMIERKO, born 27 July 1897
corresponding member 1964, regular member 1971
comparative animal biochemistry
retired full professor, PAN M. Nencki Institute for Experimental Biology,
Dr of Philosophy
foreign member of: New York Academy of Sciences
honorary member of: Polish Biochemical Society, Polish Physiological Society
state award: individual; second degree 1955
[address] Krolewska Street No 45 apt 29, 00-103 Warsaw

Jerzy PAWEŁKIEWICZ, born 16 October 1922
corresponding member 1967, regular member 1976; vice president, PAN branch
in Poznan 1981--; Seweryn Mielzynski Street No 27/29, 61-725 Poznan,
telephone 5-06-71
biochemistry, chemical technology
full professor, Dr of Chemical Sciences
state awards: individual; first degree 1974
director, Intercollegiate Institute of Biochemistry, AR in Poznan, Wolynska
Street No 35, 60-637 Poznan, telephone 22-45-81 extension 174
[address] Wladyslaw Kniewski Street No 1 apt 7, 60-743 Poznan

Karol STARMACH, born 22 September 1900
corresponding member 1969, regular member 1976
algology, fish culture
retired associate professor, UJ in Krakow, Dr of Philosophy
state award: individual first degree 1972
[address] Lobzowska Street No 45, 31-139 Krakow

Henryk SZARSKI, born 13 September 1912
corresponding member 1965, regular member 1971; member, PAN Presidium 1981--;
vice president, PAN branch in Krakow 1981--; Sławkowska Street NO 17, 31-016
Krakow, telephone 22-48-53
comparative anatomy
full professor, Dr of Philosophy
foreign member of: New Zealand Royal Society
Honorary member of: American Society of Ichthyologists and Herpetologists,
French Zoological Society
director, Institute of Comparative Anatomy, UJ Zoology Institute, Krakow,
M. Karas Street No 6, 30-060 Krakow, telephone 33-63-71 extension 429
[address] Juliusz Slowacki Street No 15 apt 8, 31-159 Krakow

Andrzej SRODON, born 23 November 1908
corresponding member 1967, regular member 1976
paleobotanist
retired full professor, PAN Institute of Botany, Dr of Natural Sciences
honorary member of: Polish Botanical Society
[address] Bohdan Zaleski Street No 4a apt 1b, 31-525 Krakow

Bernard ZABLOCKI, born 1 January 1907
corresponding member 1965, regular member 1973
microbiology, immunology
retired full professor, Lodz University, Dr of Medicine
Dr h.c.: Lodz University
honorary member of: Polish Society of Microbiologists, Polish Immunological Society
state award: individual; second degree 1968
[address] Solec Street No 52 apt 3, 00-382 Warsaw

Jan ZURZYCKI, born 10 February 1925
corresponding member 1969, regular member 1980
physiology of plant cells, photophysiology
full professor, Dr of Natural Sciences
foreign member of: Leopoldin German Academy of Natural Sciences
director, Plant Physiology Institute, Molecular Biology Institute, UJ in Krakow,
Grodzka Street No 53, 31-001 Krakow, telephone 22-71-11, extension 298
[address] Stanislaw Staszic Street No 4, apt 5, 31-162 Krakow

Corresponding Members

Romuald KLEKOWSKI, born 1 January 1924
corresponding member 1979
ecology, hydrobiology, ecological bioenergetics
full professor, Dr of Natural Sciences
director, PAN Institute of Ecology, 01-150 Dziekanow Lesny Street, telephone
34-96-66
[address] Jaktorowska Street No 2 apt 50, 01-202 Warsaw

Jan KORNAS, born 26 April 1923
corresponding member 1973
taxonomy and plant geography, plant ecology, phytosociology
full professor, Dr of Natural Sciences
Institute of Botany, UJ in Krakow, Lubicz Street No 46, 31-512 Krakow,
telephone 11-61-44
[address] Lesista Street No 5, 31-463 Krakow

Kazimierz KOWALSKI, born 15 March 1925
corresponding member 1971
zoology
full professor, Dr of Mathematical-Natural Sciences
director, PAN Institute for Systematic and Experimental Zoology, Slawkowska
Street No 17, 31-016 Krakow, telephone 22-64-10
[address] Mazowiecka Street No 51 apt 38, 30-019 Krakow

Leszek KUZNICKI, born 14 September 1928
corresponding member 1976
cell biology, evolutionism, biological methodology and history
associate professor, Dr of Natural Sciences
director, Workshop for the Physiology of Cellular Motion, PAN Marcel Nencki
Experimental Biology Institute, Ludwik Pasteur Street No 3, 02-093 Warsaw
telephone 22-42-88
[address] Przemyska Street No 11, 02-361 Warsaw

Zbigniew LORKIEWICZ, born 7 May 1923

corresponding member 1979

genetics of bacteria

full professor, Dr of Veterinary Medicine

director, Microbiology Research Center, Microbiology Institute, UMCS in Lublin,
Akademicka Street No 19, 20-033 Lublin, telephone 3-25-30

[address] Jozef Sowinski Street No 7 apt 28, 20-040 Lublin

Marian MICHNIEWICZ, born 5 December 1922

corresponding member 1971

physiology of plant growth and development

full professor, Dr of Mathematical-Natural Sciences

director, Plant Physiology Research Center, Biology Institute, Mikolaj Kopernik
University in Torun, Jurij Gagarin Street No 9, 87-100 Torun, tele. 1-34-46

[address] Stanislaw Wyspianski Street No 10 apt 1, 87-100 Torun

Wladzimierz OSTROWSKI, born 21 October 1925

corresponding member 1973; member, PAN Presidium 1975--, scientific secretary,
PAN branch in Krakow 1981--; Slawkowska Street No 17, 31-016 Krakow,
telephone 22-48-53

biochemistry of proteins and enzymes

full professor, Dr of Medical Sciences

foreign member of: New York Academy of Sciences

director, Institute of Medical Biocehmistry, Medical Academy [AM] in Krakow,
Mikolaj Kopernik Street No 7, 31-034 Krakow, telephone 22-32-72

[address] Stefan Jaracz Street No 12 apt 6, 31-132 Krakow

Przemyslaw SZAFRANSKI, born 25 February 1925

corresponding member 1969

biosynthesis of proteins

full professor, Dr of Biological Sciences

state award: groups; first degree 1978

director, Protein Biosynthesis Research Center, PAN Biochemistry and Biophysics
Institute, Rakowiecka Street No 36, 02-532 Warsaw, telephone 49-04-15

[address] Stefan Baley Street No 7 apt 8, 02-132 Warsaw

Jerzy SZWEJKOWSKI, born 11 August 1925

corresponding member 1973

botany and genetics of plant populations, taxonomy

full professor, Dr of Natural Sciences

director, Genetics Research Center, Biology Institute, Adam Mickiewicz Univ in
Poznan, Jaroslaw Dabrowski Street No 165, 60-594 Poznan, tele. 4-48-70

[address] Szczesna Street No 18, 60-587 Poznan

Andrzej K. TARKOWSKI, born 4 May 1933

corresponding member 1973

animal embryology

full professor, Dr of Natural Sciences

state award: individual; first degree 1980

director, Embryology Research Center, Zoology Institute, Warsaw University,
Krakowskie Przedmiescie Street No 26/28, 00-927 Warsaw, telephone 26-83-76

[address] Puszczyka Street No 14 apt 27, 02-777 Warsaw

Adam URBANEK, born 15 April 1928
corresponding member 1973; member, PAN Presidium and secretary, Section II--
Biological Sciences, PAN 1975--; Palace of Culture and Science, 00-901 Warsaw
telephone 20-33-64
paleozoology and evolutionary biology
full professor, Dr of Geological Sciences
International Paleontological Association (IPA), chairman, Research Group
on Graptolites 1975-1978
state award: individual; first degree 1976
director, Paleontology Research Center, Fundamental Geology Institute of
Warsaw University, Zwirka and Wigura Streets No 93, 02-089 Warsaw tele. 22-30-51
extension 92
[address] Julian Brun Street No 12 apt 11, 02-594 Warsaw

Kazimierz L. WIERZCHOWSKI, born 4 December 1929
corresponding member 1976
molecular biophysics--the physical-chemical bases of the functions of nucleic
acids
full professor, Dr of Natural Sciences
honorary member of: Romanian Biophysical Society, Union of Medical Societies
of the SRR [Soviet Socialist Republic
International Association of Photobiologists (AIP), vice president 1980-1984
director, Biophysics Research Center, PAN Institute of Biochemistry and
Biophysics, Rakowiecka Street No 36, 02-532 Warsaw, telephone 49-04-17
[address] Przyjazn Housing Complex D, No 164, 00-905 Warsaw

Lech WOJTCZAK, born 10 August 1926
corresponding member 1971
bioenergetics, biochemistry of membranes
full professor, Dr of Natural Sciences
director, Workshop for Lipids and Biological Membranes, Marcel Nencki
Experimental Biology Institute of PAN, Ludwik Pasteur Street No 3, 02-093
Warsaw, telephone 22-30-81 extension 315
[address] Grojecka Street No 81/87 apt 29, 02-094 Warsaw

Kazimierz ZARZYCKI, born 18 December 1930
corresponding member 1976
ecology, geobotany
associate professor, Dr of Natural Sciences
deputy director for academic affairs, PAN Botany Institute and director, Plant
Ecology and Geography Research Center, Lubicz Street No 46, 31-512 Krakow,
telephone 11-61-44
[address] Pokoj Blvd No 8 apt 32, 31-548 Krakow

Kazimierz ZIELINSKI, born 13 May 1929
corresponding member 1976
neurobiology
full professor, Dr of Biological Sciences
International Organization for Brain Research (IBRO), vice president 1980--
director, Marcel Nencki Experimental Biology Institute of PAN and director,
Conditioned Defense Mechanisms Laboratory, Ludwik Pasteur Street No 3, 02-093
Warsaw, telephone 22-28-31
[address] Mila Street apt 47, 01-033 Warsaw

Section III--Mathematical, Physical and Chemical Sciences

Regular Members

Osman ACHMATOWICZ, born 16 March 1899
corresponding member 1952, regular member 1961; member, PAN Presidium 1955-1957

organic chemistry

retired full professor, Warsaw University, Dr of Chemistry, Dr of Philosophy

Dr h.c.: Lodz Polytechnic

honorary member of: London Chemical Society

state award: individual; first degree 1964

[address] Nowowiejska Street No 24 apt 1, 00-665 Warsaw

Antoni BASINSKI, born 22 March 1905

corresponding member 1967, regular member 1976

physical chemistry

retired full professor, Mikolaj Kopernik University in Torun, Dr of Chemical Sciences

Dr h.c.: University of Torun

honorary member of: Polish Chemical Society

[address] Adam Mickiewicz Street No 7 apt 13, 87-100 Torun

Adam BIELANSKI, born 14 December 1912

corresponding member 1965, regular member 1973; member, PAN Presidium 1975-

physico-chemistry of solid states and heterogeneous catalysis

full professor, Dr of Philosophy

UJ Chemistry Institute, M. Karas Street No 3, 30-060 Krakow, telephone 3-63-77

[address] Jaskolcza Street No 6, 30-105 Krakow

Marian DANYSZ, born 17 March 1909

corresponding member 1960, regular member 1969

high-energy physics of elementary particles

retired full professor, Warsaw University

Dr h.c.: Warsaw University

foreign member of: Heidelberg Academy of Sciences

International Union of Pure and Applied Chemistry (IUPAC), vice president 1963-1969; Dubno United Institute for Nuclear Studies, vice director 1956-1959

state award: group; second degree 1955, group; first degree 1966

[address] Asfaltowa Street No 2, 02-527 Warsaw

Andrzej HRYNKIEWICZ, born 29 May 1925

corresponding member 1969, regular member 1980

low-energy nuclear physics and physics of solid states

full professor, Dr of Natural Sciences

Dubno United Institute for Nuclear Studies, vice director 1966-1968

director, Research Institute II of Nuclear Spectroscopy of the Nuclear Physics Institute, Eliasz Radzikowski Street No 152, 31-342 Krakow, telephone 37-02-22

[address] Wolnosc Square No 4 apt 14, 30-033 Krakow

Wilhelmina IWANOWSKA, born 2 September 1905
corresponding member 1956, regular member 1976
astrophysics
retired full professor, Mikolaj Kopernik University in Torun, Dr of Exact Sciences

Dr h.c.: Univ of Leicester, Univ of Torun, Univ of Winnipeg
honorary member of: Scientific Society in Torun, Mikolaj Kopernik Polish Society of Naturalists, Canadian Royal Astronomical Society
International Astronomical Union (IAU), vice president 1973-1979
[address] Jozef I.Kraszewski Street No 20 apt 15, 87-100 Torun

Zbigniew JEDLINSKI, born 8 October 1922
corresponding member 1971, regular member 1980
chemistry and technology of polymers
full professor, Dr of Chemical Sciences
state award: group; second degree 1964, 1978
director, Wincenty Pstrowski Institute of the Physico-Chemistry and Technology of Polymers of Slask Polytechnic in Gliwice, Kuczewski Street No 9, 44-100 Gliwice, telephone 31-45-64
director, PAN Polymers Research Institute, Maria Sklodowska-Curie Street No 34, 41-800 Zabrze, telephone 71-60-77
[address] Karolinka Street No 16, 44-100 Gliwice

Boguslawa JEZOWSKA-TRZEBIATOWSKA, born 19 November 1908
corresponding member 1967, regular member 1973; member, PAN Presidium 1978-;
president, PAN branch in Wroclaw 1978-; Podwale Street No 75, 50-449 Wroclaw, telephone 44-48-13
inorganic and bioinorganic physico-chemistry, structural coordination chemistry, spectroscopy
retired full professor, Boleslaw Bierut University of Wroclaw, Dr of Technical Sciences
Dr h.c.: Slovak Higher Technical School of Bratislava, Univ of Moscow, Univ of Wroclaw, Wroclaw Polytechnic
foreign member of: GDR Academy of Sciences
13th International Conference on Coordination Chemistry 1970 (IUPAC, PAN),
president; International Conference on Molecular Spectroscopy 1972 (PAN),
president; First International Conference for the Improvement of Chemistry Teaching 1973 (UNESCO, IUPAC, PAN), president; 13th European Congress on Molecular Spectroscopy 1977 (IUPAC, EPS [expansion unavailable], PAN), president
state awards: individual; second degree 1964, individual; first degree 1976
director, Structural Chemistry Research Center of the Institute of Low Temperatures and Structural Studies, PAN, Cathedral Square No 1, 50-950 Wroclaw telephone 22-33-25
[address] Bracia Gierymscy Street No 20, 51-636 Wroclaw

Wiktor KEMULA, born 6 March 1902
corresponding member 1956, regular member 1961
electrochemistry, physico-chemical methods of analytical chemistry
retired full professor, Warsaw Univ, Dr of Philosophy, Dr of Chemical Sciences
foreign member of: Leopoldin German Academy of Natural Sciences
honorary president of: Polish Chemical Society, honorary member of: American
Chemical Society, Czechoslovakian Chemical Society, Japanese Chemical Society,
Royal Chemical Society of England, GDR Chemical Society, Paris Society of
Industrial Chemistry
International Union of Pure and Applied Chemistry (IUPAC), Section on Chemical
Analysis, vice chairman 1967-1969, Analytical Chemistry Division, chairman
1969-1971
state award: individual; second degree 1955, 1972
[address] Leon Schiller Street No 8 apt 7, 00-248 Warsaw

Włodzimierz KOŁOS, born 6 September 1928
corresponding member 1969, regular member 1976; member, PAN Presidium and
secretary, Section III--Mathematical, Physical and Chemical Sciences, PAN
1981--; Palace of Culture and Science, 00-901 Warsaw, telephone 20-33-46
quantum chemistry
full professor, Dr of Physical Sciences
director, Quantum Chemistry Laboratory, Institute for Basic Chemistry Problems,
Warsaw Univ, Ludwik Pasteur Street No 1, 02-993 Warsaw, tele 22-23-09
[address] Ludwik Narbutt St No 53 apt 12, 02-529 Warsaw

Wojciech KROLIKOWSKI, born 16 July 1926
corresponding member 1969, regular member 1980
theory of elementary particles, quantum field theory
full professor, Dr of Mathematical-Physical Sciences
director, Elementary Particle Theory Research Center, Institute for Theoretical
Physics, Warsaw Univ, Hoza St No 69, 00-689 Warsaw, tele 28-30-31 ext 281
[address] Chmielna St No 116/118 apt 99, 00-801 Warsaw

Stanisław LOJASIEWICZ, born 9 October 1926
corresponding member 1971, regular member 1980
mathematical analysis
full professor, Dr of Mathematical Sciences
state award: individual; second degree 1968
director, Real Functions Research Center, UJ Mathematics Institute, Władysław
Reymont St No 4, 30-059 Krakow, tele 33-63-77 ext 584, 33-97-81
[address] Kornel Ujejski St No 6, apt 3, 30-102 Krakow

Stanisław MALINOWSKI, born 30 June 1909
corresponding member 1971, regular member 1980
organic chemistry and technology, catalysis
retired full professor, Warsaw Polytechnic, Dr of Chemical Sciences
[address] Filtrowa St No 61 apt 3, 02-056 Warsaw

Jan MICHALSKI, born 7 June 1920
corresponding member 1962, regular member 1969; member, PAN Presidium 1966--, secretary, Section II--Mathematical-Physical, Chemical and Geological-Geographical Sciences 1972-1977, president, PAN branch in Lodz 1978--; Tylna St No 1, 90-364 Lodz, tele 4-31-20
chemistry of hetero-organic compounds
full professor, Dr of Philosophy
foreign member of: GDR Academy of Sciences
state awards: group; second degree 1968, individual; first degree 1978
director, PAN Center for Molecular and Macromolecular Studies, Tylna St No 1, 90-364 Lodz, tele 4-16-00
[address] Brzezna St No 6 apt 3, 90-303 Lodz

Marian MIESOWICZ, born 21 November 1907
corresponding member 1959, regular member 1964; member, PAN Presidium 1966-1980, vice president PAN 1969-1977, president, PAN branch in Krakow 1969-1980
nuclear physics
retired full professor, Stanislaw Staszic Mining-Metallurgy Academy [AGH] in Krakow, Dr of Philosophy
Dr h.c.: AGH Krakow, UJ Krakow
state awards: group; third degree 1952, group; second degree 1955, group; first degree 1964, Special Award 1979
[address] Mikolajska St No 6 apt 7, 31-027 Krakow

Jan MIKUSINSKI, born 3 April 1913
corresponding member 1965, regular member 1971
functional analysis, distribution theory, collision theory
full professor, Dr of Philosophy
Dr h.c.: Univ of Rostock
foreign member of: Serbian Academy of Sciences and Arts
state award: individual; second degree 1953
director, Generalized Functions Research Center, PAN Mathematics Institute, Wieczorka St No 8, 40-013 Katowice, tele 53-71-64
[address] Jaworowa No 1, 40-650 Katowice

Wladyslaw ORLICZ, born 24 May 1903
corresponding member 1956, regular member 1961
functional analysis
retired full professor, Adam Mickiewicz Univ in Poznan and PAN Mathematics Institute, Dr of Philosophy
Dr h.c.: Poznan Polytechnic, Univ of York
honorary member of: Polish Mathematical Society
state awards: individual; second degree 1952, individual; first degree 1966
[address] Karol Libelt St No 22 apt 4, 61-707 Poznan

Arkadiusz PIEKARA, born 12 January 1904
corresponding member 1962, regular member 1973
non-linear di-electric and optical phenomena
retired full professor, Warsaw Univ, Dr of Philosophy
foreign member of: London Institute of Physics (regular)
honorary member of: Society of Friends of Radzymin
state awards: individual; third degree 1955, individual; second degree 1970
[address] Opoczynska St No 11 apt 11, 02-522 Warsaw

Stefan PIOTROWSKI, born 11 April 1910
corresponding member 1962, regular member 1969; member, PAN Presidium 1972-
1974
astrophysics
retired full professor, Warsaw Univ, Dr of Philosophy
honorary member of: Polish Society of Friends of Astronomy
state award: individual; third degree 1952
[address] Koszykowa St No 75 apt 23, 00-662 Warsaw

Jerzy PNIEWSKI, born 1 June 1913
corresponding member 1964, regular member 1971
high-energy physics and physics of elementary particles, hypernucleic physics
full professor, Dr of Physics
Dr h.c.: Univ of Lyons I, Univ of Heidelberg
foreign member of: Heidelberg Academy of Sciences
honorary member of: Plock Scientific Society
state awards: group; second degree 1955, group; first degree 1966
High-energy Physics Research Center, Experimental Physics Institute, Warsaw
Univ, Hoza St No 69, 00-681 Warsaw, tele 29-42-09
[address] Koszykowa St No 75 apt 33, 00-662 Warsaw

Czeslaw RYLL-NARDZEWSKI, born 7 October 1926
corresponding member 1967, regular member 1973
fundamentals of mathematics and mathematical logic, probability theory
full professor, Dr of Philosophy
state award: individual; second degree 1966
Mathematics Institute, Wroclaw Polytechnic,
Stanislaw Wyspianski Wybrzeze [Coast] No 27, 50-370 Wroclaw, tele 20-25-26
[address] Muzealny [Museum] Square No 4 apt 13, 50-035 Wroclaw

Jan RZEWUSKI, born 19 December 1916
corresponding member 1967, regular member 1976
field theory
full professor, Dr of Natural Sciences
state award: individual; second degree 1966
director, Field Theory Research Center, Theoretical Physics Institute, Wroclaw
Univ named for Boleslaw Bierut, Wojciech Cybulski St No 36, 50-205 Wroclaw,
tele 22-23-63
[address] Jozef Lewartowski St No 34, 53-211 Wroclaw

Roman SIKORSKI, born 11 July 1920
corresponding member 1962, regular member 1969
fundamentals of mathematics, mathematical analysis, functional analysis,
Boolean algebra
full professor, Dr of Mathematical-Natural Sciences
honorary member of: Polish Mathematical Society
state award: individual; second degree 1955
Mathematical Analysis Research Center, Warsaw Univ Institute of Mathematics,
Palace of Culture and Science 00-901 Warsaw, tele 20-02-11 ext 25-39
[address] Chocimska St No 35 apt 9, 00-791 Warsaw

Leonard SOSNOWSKI, born 19 February 1911
corresponding member 1960, regular member 1969; member, PAN Presidium and
vice president, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw,
tele 20-45-53
full professor, Dr of Exact Sciences
Dr h.c.: Univ of Paris VI named for Pierre and Marie Curie
International Union for Pure and Applied Physics (IUPAP), vice president 1972-
1978, president 1978-1981
state awards: individual; first degree 1972, group; first degree 1978
director, Physics of Solid Bodies Research Center, Warsaw Univ Institute for
Experimental Physics, Hoza St No 69, 00-681 Warsaw, tele 28-76-49
[address] Pulawska St No 1 apt 8, 02-515 Warsaw

Bohdan STALINSKI, born 1 March 1924
corresponding member 1969, regular member 1976; deputy scientific secretary,
PAN branch in Wroclaw 1981--, Podwale St No 75, 50-449 Wroclaw, tele 44-48-13
physico-chemistry of solid states
full professor, Dr of Chemical Sciences
director, Institute of Low Temperatures and Structural Research of PAN,
Katedralny [Cathedral] Square No 1, 50-950 Wroclaw, tele 22-96-29
[address] Wielka St No 28 apt 3, 53-341 Wroclaw

Michał SMIAŁOWSKI, born 14 December 1906
corresponding member 1952, regular member 1961; member, PAN Presidium 1952-1974,
secretary Section III--Mathematical-Physical, Chemical and Geological-Geographic
Sciences 1952-1971
physical chemistry, physical metallurgy
retired full professor, PAN Physical Chemistry Institute
Dr of Technical Sciences
foreign member of: Saxon Academy of Sciences
state award: individual; second degree 1951
[address] Marszalkowska St No 73 apt 18, 00-676 Warsaw

Andrzej TRAUTMAN, born 4 January 1933
corresponding member 1969, regular member 1976; member, PAN Presidium 1972--,
vice president PAN 1978-1980
theory of relativity and gravitation, geometric methods in physics
full professor, Dr of Physical Sciences
foreign member of: Czechoslovakian Academy of Sciences
state award: individual; first degree 1976

director, Warsaw Univ Institute of Theoretical Physics, Hoza St NO 69, 00-681
Warsaw, tele 28-30-31, ext 264, 28-33-96
[address] Slupecka St No 4 apt 87, 02-309 Warsaw

Wladzimierz TRZEBIATOWSKI, born 25 February 1906
corresponding member 1952, regular member 1956; member, PAN Presidium 1963-
1980, vice president PAN 1969-1971, president PAN 1972-1977, president, PAN
branch in Wroclaw 1970-1971

inorganic structural chemistry

retired full professor, PAN Low Temperatures and Structural Research Institute,
Dr of Technical Sciences

Dr h.c.: Univ of Katowice, Univ of Warsaw, Univ of Wroclaw, Wroclaw Polytechnic
foreign member of: Cuban Academy of Sciences (honorary), Academic of Sciences
of the Mongolian People's Republic, GDR Academy of Sciences, USSR Academy of
Sciences, Bulgarian Academy of Sciences, Czechoslovakian Academy of Sciences
honorary member of: Polish Chemical Society, Polish Naturalists' Society
named for Mikolaj Kopernik

state awards: individual; second degree 1955, individual; first degree 1974,
Special Award 1979

director, International Laboratory of Strong Magnetic Fields and Low Tempera-
tures, Prochnik St No 95, 53-529 Wroclaw, tele 61-27-21

[address] Bracia Gierymscy St No 20, 51-636 Wroclaw

Kazimierz URBANIK, born 5 February 1930

corresponding member 1965, regular member 1973; member, PAN Presidium 1969-
1980, president, PAN branch in Wroclaw 1972-1977

functional analysis, probability theory

full professor, Dr of Mathematical Sciences

foreign member of: The Hague International Statistical Institute

state awards: individual; second degree 1964, individual; first degree 1978

director, Institute of Mathematics and director, Probability Theory Research
Center, Wroclaw Univ named for Boleslaw Bierut, Uniwersytecki Square No 1,
50-137 Wroclaw, tele 22-97-17

[address] Franciszek Stefczyk St No 8, 51-662 Wroclaw

Tadeusz URBANSKI, born 26 October 1901

corresponding member 1952, regular member 1956; member, PAN Presidium 1955-1965
chemical organic technology

retired full professor, Warsaw Polytechnic, Dr of Technical Sciences

foreign member of: Leopoldin German Academy of Natural Sciences

honorary member of: Polish Chemical Society

state awards: individual; first degree 1949, 1976; individual; second degree
1952

[address] Nowowiejska St No 22 apt 27, 00-665 Warsaw

Jozef WERLE, born 23 July 1923

corresponding member 1965, regular member 1976

physics of elementary particles

full professor, Dr of Physics

director, Research Center for Nuclear Theory and Nuclear Reactions, Warsaw
Univ Theoretical Physics Institute, Hoza St No 69, 00-681 Warsaw tele 21-40-97
[address] Wilcza St No 62 apt 7, 00-679 Warsaw

Maciej WIEWIOROWSKI, born 24 August 1918
corresponding member 1965, regular member 1976; member, PAN Presidium 1969--, vice president, PAN 1981--; Palace of Culture and Science 00-901 Warsaw, tele 20-45-53
organic spectrochemistry and chemistry of natural products
full professor, Dr of Mathematical-Natural Sciences
state award: individual; first degree 1980
director, PAN Bio-organic Chemistry Research Center, Zygmunt Neskowski St No 12/14, 61-704 Poznan, tele 5-85-03, 5-05-32
[address] Grunwaldzka St No 27 apt 11, 60-783 Poznan

Jerzy WROBEL, born 29 April 1923
corresponding member 1973, regular member 1980
natural products and heterocyclic compounds
director, Laboratory for the Analysis of Natural Organic Raw Materials, Warsaw Univ Chemistry Faculty, Ludwik Pasteur St No 1, 02-093 Warsaw, tele 22-97-46
[address] Rakowiecka St No 22 apt 27, 02-521 Warsaw

Corresponding Members

Bogdan BARANOWSKI, born 27 October 1927
corresponding member 1973
chemistry of solid states, thermodynamics of irreversible processes
full professor, Dr of Chemical Sciences
foreign member of: Leopoldin German Academy of Natural Sciences
International Association for Progress in Science and High-pressure Technology, vice president 1981--
director, Research Center for the Physico-Chemistry of Solid States, PAN Physical Chemistry Institute, Kasprzak St No 44/52, 01-224 Warsaw tele 32-07-49
[address] Stefan Zeromski St No 64 apt 30, 01-846 Warsaw

Czeslaw BESSAGA, born 26 February 1932
corresponding member 1976
functional analysis
full professor, Dr of Mathematical Sciences
state award: group; first degree 1974
vice director, Institute of Mathematics and director, Functional Analysis Research Center, Warsaw Univ, Palace of Culture and Science 00-901 Warsaw tele 2-47-40
[address] Miodowa St No 23 apt 27, 00-246 Warsaw

Andrzej BIALAS, born 26 July 1936
corresponding member 1976
theoretical physics
full professor, Dr of Mathematical-Physical Sciences
state award: group; second degree 1974
director, Particle Theory Research Center, UJ Physics Institute, Wladyslaw Reymont St No 4, 30-059 Krakow, tele 33-52-80
[address] Kremerowska St No 5 apt 2, 31-130 Krakow

Iwo BIALYNICKI-BIRULA, born 14 June 1933
corresponding member 1976
theoretical physics
full professor, Dr of Mathematical-Physical Sciences
director, Theoretical Physics Research Center, PAN Physics Institute,
al. Lotnikow [Pilots' Blvd] No 32/46, 02-668 Warsaw, tele 43-70-01 ext 337,
43-53-24
[address] Wernyhora St No 32, 02-727 Warsaw

Bogdan BOJARSKI, born 13 May 1931
corresponding member 1973
differential equations, mathematical analysis
full professor, Dr of Mathematical-Physical Sciences
director, Differential Equations Research Center, Warsaw Univ Mathematics
Institute, Palace of Culture and Science, 00-901 Warsaw, tele 20-47-40
[address] Ludwik Nabielak St No 18 apt 6, 00-743 Warsaw

Zbigniew CIESIELSKI, born 1 October 1934
corresponding member 1973
mathematical analysis
full professor, Dr of Mathematical Sciences
director, Gdansk branch, PAN Mathematical Institute, Abraham St No 18, 81-825
Sopot, tele 51-08-04
[address] 23 Marca [23rd of March] St No 79, apt 49, 81-820 Sopot

Wieslaw CZYZ, born 2 May 1927
corresponding member 1973
physics of the atomic nucleus
full professor, Dr of Physical Sciences
state award: individual; second degree 1972
director, Research Center IV for Theoretical Physics, Nuclear Physics Institute,
Eliasz Radzikowski St No 152, 31-342 Krakow, tele 37-02-22 ext 272
[address] Marian Smoluchowski St No 8 apt 30, 30-083 Krakow

Jerzy HABER, born 7 May 1930
corresponding member 1973
physico-chemistry of solid states, physico-chemistry of surface phenomena,
catalysis
full professor, Dr of Chemical Sciences
International Committee on Catalysis (ICCC), vice president 1980-1984,
International Union for Pure and Applied Chemistry (IUPAC), Commission on the
Colloids of the Surface Chemistry of Catalysis, vice president 1979-1983 and
Catalysis Subcommittee, president 1978-1983, International Committee on the
Reactivity of Solid States (ICRS), president 1976-1984
director, Research Center for Catalysis and Physico-chemistry of Surfaces of
PAN, Niezapominajki St No 30-239 Krakow, tele 22-57-27
[address] Bronislawa St No 15, 30-203 Krakow

Jerzy Janik, born 30 April 1927
corresponding member 1973
physics of condensed matter
full professor, Dr of Philosophy
director, Research Center II for Structural Studies, Nuclear Physics Institute,
Eliasz Radzikowski St No 152, 31-342 Krakow, tele 37-02-22 ext 250
[address] St Mark St No 8, apt 2, 31-012 Krakow

Jerzy KOŁODZIEJCZAK, born 17 June 1935
corresponding member 1973; member PAN Presidium and deputy scientific secretary, PAN 1975-1980
physics of semi-conductors
full professor, Dr of Mathematical-Physical Sciences
state award: group; first degree 1978
PAN Physics Institute, Al Lotników [Pilots' Blvd] No 32/46, 02-663 Warsaw
tele 43-68-71
[address] Walbrzyska St No 19 apt 63, 02-739 Warsaw

Jerzy Kroh, born 28 August 1924
corresponding member 1976
radiation chemistry
full professor, Dr of Chemical Sciences
European Association for Radiation Chemistry named for Miller (MTRC), vice president 1969-1977
rector, Łódź Polytechnic, Franciszek Zwirka St No 36, 90-924 Łódź, tele 6-55-22, ext 200, 6-85-22
director, Interministerial Institute for Radiation Technology of Łódź Polytechnic, Waleria Wróblewski St No 15, 93-590 Łódź, tele 6-55-22 ext 600
[address] Wschodnia [East] St No 61, 90-266 Łódź

Marian KRYSZEWSKI, born 17 April 1925
corresponding member 1976
physico-chemistry and physics of polymers
full professor, Dr of Chemical Sciences
deputy director, PAN Center for Molecular and Macromolecular Studies, Tylna St No 1, 90-364 Łódź, tele 4-89-81
[address] Jarosław Dąbrowski Square No 3 apt 6, 90-249 Łódź

Henryk KUCZYNSKI, born 26 July 1909
corresponding member 1969
stereochemistry
retired full professor, Wrocław Polytechnic, Dr of Technical Studies
[address] Witelson St No 9, 51-616 Wrocław

Zygmunt LASOCKI, born 16 November 1922
corresponding member 1973; scientific secretary, PAN branch in Łódź 1978--, Tylna St No 1 90-364 Łódź, tele 4-31-20
chemistry of polymers
full professor, Dr of Technical Sciences
director, Teaching and Scholarly Group of the Polymers Institute of Łódź Polytechnic, Franciszek Zwirka St No 36, 90-924, Łódź tele 6-55-22 ext 261
[address] Stanisław Lorentz St No 4 apt 5, 91-083 Łódź

Jan LOPUSZANSKI, born 21 October 1923
corresponding member 1976
quantum field theory and quantum theory of elementary particles
full professor, Dr of Physics
director, Theoretical Physics Institute, Wroclaw Univ named for Boleslaw
Bierut, Wojciech Cybulski St No 36, 50-205 Wroclaw tele 22-23-63
[address] Bracia Gierymscy St No 79, 51-640 Wroclaw

Jerzy LOS, born 22 March 1920
corresponding member 1964
fundamentals of mathematics, algebra, mathematic economics
full professor, Dr of Mathematical-Natural Sciences
director, Mathematical Methods of Economics Section, PAN Institute for the
Foundations of Information Science, Palace of Culture and Science, 00-901
Warsaw, tele 20-02-11 ext 27-20
[address] Wiejska St No 9 apt 121, 00-480 Warsaw

Kazimierz LUKASZEWICZ, born 26 March 1927
corresponding member 1979
crystallography
full professor, Dr of Technical Sciences
director, Crystallography Research Center, PAN Institute of Low Temperatures
and Structural Research, Katedralny [Cathedral] Square No 1, 50-950 Wroclaw,
tele 20-10-71
[address] Katowicka St No 43 apt 5, 52-022 Wroclaw

Jerzy MINCZEWSKI, born 11 December 1916
corresponding member 1973
analytical chemistry of traces
full professor, Dr of Chemical Sciences
plenipotentiary of the government for atomistics affairs
Krucza St No 36, 00-522 Warsaw, tele 28-27-22
[address] Wilcza St No 14 apt 13, 00-532 Warsaw

Stanislaw MROWEC, born 29 July 1928
corresponding member 1976
physico-chemistry of solid states, metals corrosion
full professor, Dr of Chemical Sciences
Ninth International Symposium on the Reactivity of Solid Bodies 1980, chairman,
Organization Committee
director, Materials Engineering Institute, AGH named for Stanislaw Staszic,
Adam Mickiewicz Blvd No 30, 30-059 Krakow, tele 33-81-00 ext 24-67
[address] 18 Stycznia [18 January] St NO 66 apt 7, 30-045 Krakow

Czeslaw OLECH, born 22 May 1931
corresponding member 1973; member, PAN Presidium 1975-1980
ordinary differential equations, mathematical theory of optimum control
full professor, Dr of Mathematical Sciences
state award: individual; first degree 1976
director, PAN Mathematics Institute, Sniadecki St NO 8, 00-950 Warsaw
tele 29-66-92
[address] Nowy Swiat St No 23/25 apt 1, 00-029 Warsaw

Bohdan PACZYNSKI, born 8 February 1940
corresponding member 1976
astrophysics
full professor, Dr of Astronomic Sciences
foreign member of: Leopoldin German Academy of Natural Sciences
honorary member of: Great Britain Royal Astronomical Society
state award: individual; first degree 1980
director, Astrophysics Laboratory, PAN Mikolaj Kopernik Astronomical Center,
Bartycka St No 16, 00-716 Warsaw, tele 41-00-41 ext 40
[address] Adam Plug St No 1 apt 68, 02-047 Warsaw

Stanislaw PASYNKIEWICZ, born 29 March 1930
corresponding member 1976
organo-metallic chemistry
full professor, Dr of Chemical Sciences
Federation of European Chemical Societies, chairman, Working Group for
Organometallic Chemistry 1974--
director, Research Team on Homogeneous Catalysis, Chemistry and Organic
Technology Institute, Warsaw Polytechnic, Koszykowa St No 7, 00-662 Warsaw,
tele 2-10-07 ext 971
[address] Niepodleglosc Blvd No 151 apt 13, 02-555 Warsaw

Aleksander PELCZYSKI, born 2 July 1932
corresponding member 1976
functional analysis
full professor, Dr of Mathematical Sciences
state award: group; first degree 1974
director, Functional Analysis Research Center, PAN Mathematics Institute,
Sniadecki St No 8, 00-950 Warsaw, tele 28-24-71
[address] Filtrowa St No 63 apt 36, 02-056 Warsaw

Andrzej PLIS, born 17 March 1929
corresponding member 1976
differential equations
full professor, Dr of Mathematical Sciences
director, Differential Equations Section, PAN Mathematics Institute, Ludwik
Solski St No 30, 31-027 Krakow, tele 22-87-06
[address] Gabriela Zapolska St No 16a, 30-126 Krakow

Henryk RATAJCZAK, born 30 September 1932
corresponding member 1976
chemical physics, molecular spectroscopy
associate professor, Dr of Mathematical-Physical Sciences
director, Chemistry Institute and director, Research Center for Theoretical
Chemistry and Chemical Physics, Wroclaw Univ named for Boleslaw Bierut,
Fryderyk Joliot-Curie St No 14, 50-383 Wroclaw tele 22-23-48
[address] Bystrzycka St No 71 apt 9, 54-215 Wroclaw

Jan RYCHLEWSKI, born 23 May 1934
corresponding member 1973; member, PAN Presidium and secretary, Section III--
Mathematical, Physical and Chemical Sciences, PAN 1978-1980
mechanics, applied mathematics
associate professor, Dr of Technical Sciences
state award: group; second degree 1968
director, Research Group for the Mathematical Theory of Plasticity, PAN
Institute for the Fundamental Problems of Technology, Swietokrzyska St No 21,
00-049 Warsaw, tele 26-12-81
[address] Niepodleglosc Blvd No 132 apt 70, 02-554 Warsaw

Andrzej SCHINZEL, born 5 April 1937
corresponding member 1979
numbers theory
full professor, Dr of Mathematical-Physical Sciences
foreign member of: Leopoldin German Academy of Natural Sciences
state award: individual; second degree 1974
director, Numbers Theory Research Center, PAN Mathematics Institute, Sniadecki
St No 8, 00-950 Warsaw, tele 28-24-71
[address] Brzozowa St No 12 apt 24, 00-286 Warsaw

Lucjan SOBCZYK, born 4 August 1927
corresponding member 1976
structure of molecules and intermolecular reactions
full professor, Dr of Chemical Sciences
Director, Physical Chemistry Research Center, Chemistry Institute, Wroclaw
Univ named for Boleslaw Bierut, Fryderyk Joliot-Curie St No 14, 53-383 Wroclaw
tele 22-92-81
[address] Marian Smoluchowski St No 52 apt 5, 50-372 Wroclaw

Ryszard SOSNOWSKI, born 5 January 1932
corresponding member 1976; deputy secretary, Section II--Mathematical,
Physical and Chemical Sciences, PAN 1978--; Palace of Culture and Science,
00-901 Warsaw, tele 20-33-46
nuclear physics
full professor, Dr of Physical Sciences
director, Research Center VI--High-Energy Physics, Institute for Nuclear
Research, Hoza St No 69, 00-681 Warsaw, tele 21-28-04
[address] Marcin Kromer St No 3 apt 1, 02-062 Warsaw

Jan STANKOWSKI, born 1 January 1934
corresponding member 1979; deputy scientific secretary, PAN branch in Poznan
1981--; Mielzynski St No 27/29, 61-725 Poznan, tele 5-06-71
solid body radiospectroscopy
full professor, Dr of Mathematical-Physical Sciences
director, PAN Molecular Physics Institute, Marian Smoluchowski St NO 17/19,
60-179 Poznan, tele 67-47-51
[address] Obornicka St No 39 apt 31, 60-648 Poznan

Zdzislaw SZYMANSKI, born 2 February 1926
corresponding member 1973
atomic nuclear theory
full professor, Dr of Physics
vice director, Theoretical Physics Institute and director, Research Center
for the Structure of the Atomic Nucleus of Warsaw Univ, Hoza St No 69, 00-681
Warsaw, tele 28-30-31 ext 280
[address] Wilcza St No 62 apt 27, 00-679 Warsaw

Andrzej Kajetan WROBLEWSKI, born 7 August 1933
corresponding member 1976
physics of elementary particles and high energies
full professor, Dr of Physical Sciences
Dr h.c.: Univ of Siegen (FRG)
director, Research Center for the Physics of Elementary Particles, Warsaw
Univ Experimental Physics Institute, Hoza St NO 69, 00-681 Warsaw, tele 28-30-31
ext 280, 21-38-10
[address] Julian Marchlewski St No 68 apt 64, 00-170 Warsaw

Wojciech ZIELENKIEWICZ, born 6 June 1933
corresponding member 1976
physico-chemistry, calorimetrage and thermochemistry
associate professor, Dr of Chemical Sciences
foreign member of: Barcelona Royal Academy of Sciences
director, PAN Physical Chemistry Institute and director, Calorimetrage
Research Center, Marcin Kasprzak St NO 44/52, 01-224 Warsaw, tele 32-73-43
[address] Leon Schiller St No 8 apt 30, 00-248 Warsaw

Section IV--Technical Sciences

Regular Members

Tadeusz CHOLEWICKI, born 23 October 1907
corresponding member 1965, regular member 1980
theory of circuits and electrical systems
retired full professor, Warsaw Polytechnic
honorary member of: Polish Society of Theoretical and Applied Electro-
technology
[address] Polna St No 54 apt 72, 00-644 Warsaw

Janusz CIBOROWSKI, born 26 January 1918
corresponding member 1967, regular member 1973
chemical and process engineering
full professor, Dr of Technical Sciences
Dr h.c.: Lensoviet Leningrad Technological Institute
state awards: individual; second degree 1953, group; second degree 1955
director, Warsaw Polytechnic Institute for Chemical Engineering, Ludwik
Warynski St No 1, 00-645 Warsaw, tele 25-14-40, 25-91-80
[address] Koszykowa St No 75 apt 7, 00-662 Warsaw

Boleslaw DUBICKI, born 18 March 1906
corresponding member 1960, regular member 1969
electrical machinery
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
honorary member of: Polish Society of Theoretical and Applied Electro-
technology, Polish Electricians Association
[address] Zwyciezcy St No 3/5 apt 10, 03-936 Warsaw

Leszek FILIPCZYNSKI, born 23 December 1923
corresponding member 1969, regular member 1976
ultrasound
full professor, Dr of Technical Sciences
honorary member of: American Institute for Ultrasound in Medicine
European Federation of "Ultrasound in Medicine and Biology" Societies,
vice president 1975-1979
state awards: group; second degree 1966, 1978
director, Ultrasound Research Center, PAN Institute for Basic Technical
Problems, Swietokrzyska St No 21, 00-049 Warsaw, tele 26-90-41, 26-12-81
ext 173
[address] Akacjowa St No 10 apt 4, 02-534 Warsaw

Wladyslaw FISZDON, born 12 June 1912
corresponding member 1960, regular member 1969; member, PAN Presidium 1981--
mechanics of liquids and gasses, kinetic theory of gasses, mathematical
applications in mechanics
full professor, Dr of Technical Sciences
foreign member of: International Astronautics Academy, Paris
honorary member of: Great Britain Royal Astronautics Society
International Astronautics Federation (IFA), vice president 1965-1967
state award: group; second degree 1955
director, Research Center for the Mechanics of Liquids and Gasses, Mechanics
Institute of Warsaw Univ, Palace of Culture and Science, 00-901 Warsaw,
tele 20-47-40, 20-02-11 ext 25-62
Research Center for the Mechanics of Liquids and Gasses, PAN Institute for
Basic Technical Problems, Swietokrzyska St No 21, 00-049 Warsaw, tele 26-98-03
[address] Nowowiejska St NO 24 apt 2, 00-665 Warsaw

Janusz GROSZKOWSKI, born 21 March 1898
regular member 1952; member, Pan Presidium 1955-1980, Pan vice president
1957-1962, Pan president 1963-1971
radio-engineering, vacuum engineering and technology
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
Dr h.c.: Gdansk Polytechnic, Lodz Polytechnic, Warsaw Polytechnic
foreign member of: Cuban Academy of Sciences (honorary), Academy of Sciences
of the Socialist Republic of Romania, USSR Academy of Sciences, Bulgarian
Academy of Sciences, Czechoslovakian Academy of Sciences, Hungarian Academy of
Sciences (honorary)
honorary member of: Polish Society for Theoretical and Applied Electro-
technology, Polish Electricians Association, New York Institute of Engineers,
Electricians and Electronic Engineers, Society of Electronic Engineers and
Radio-electricians of France

International Union for Radio Sciences (URSI), vice president 1966-1972
state awards: individual; first degree 1951, 1968, group; first degree 1955,
Special Award 1979
[address] Nowowiejska St No 22 apt 7, 00-665 Warsaw

Jerzy GRZYMEK, born 9 April 1908
regular member 1973
technology of silicates and building materials
retired full professor, AGH named for Stanislaw Staszic in Krakow, Dr of
Technical Sciences
Dr h.c.: AGH Krakow
International Association of Laboratories for the Research of Materials and
Structures (RILEM), chairman of the Technology Commission 1956-1970
state award: individual; first degree 1951, group; second degree 1955, group;
first degree 1968
[address] Adam Mickiewicz No 34/36 apt 37, 01-616 Warsaw

Janusz Lech JAKUBOWSKI, born 9 December 1905
corresponding member 1952, regular member 1956; member, PAN Presidium 1952-
1968
high-voltage technology
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
foreign member of: Academy of Sciences, Epigraphs and Literature of Toulouse
honorary member of: Polish Electricians Association
head of the UNESCO "Algerie 1 et 2" projects 1967-1971
state award: individual; second degree 1951
[address] Iganska St No 9 apt 2, 04-087 Warsaw

Jan KACZMAREK, born 2 February 1920
corresponding member 1965, regular member 1971; member, PAN Presidium 1969-
1980, scientific secretary, PAN 1972-1980
theory of metalworking, superficial layer physics
full professor, Dr of Technical Sciences
Dr h.c.: Karl-Marx-Stadt Polytechnic, Moscow Polytechnic (MVTU)
foreign member of: GDR Academy of Sciences, Bulgarian Academy of Sciences,
Royal Academy of Sciences, Literature and Fine Arts of Belgium, U.S. National
Academy of Technical Sciences
honorary member of: Association of Polish Engineers and Technician-Mechanics,
Association for Progress in Industrial Mechanics (GAMI)
International Scientific-Research College for Mechanical Technology (CIRP),
president 1972-1975
director, Mechanical Systems Research Center, PAN Institute for Basic
Technical Problems, Swietokrzyska St No 21, 00-049 Warsaw tele 26-98-06
Institute for Machine Technology, Krakow Polytechnic named for Tadeusz
Kosciuszko, Warsaw St No 24, 31-155 Krakow, tele 33-35-55
[address] Al. I Armii WP [First Army of the Polish Army Blvd] No 16 apt 46,
00-582 Warsaw

Igor KISIEL born 17 November 1910
corresponding member 1969, regular member 1976
land growth rate and reology
retired full professor, Wroclaw Polytechnic, Dr of Technical Sciences
[address] Bracia Gierymscy St No 140, 51-640 Wroclaw

Roman KULIKOWSKI, born 1 March 1928
corresponding member 1967, regular member 1976; member, PAN Presidium 1972-1977, deputy scientific secretary, PAN 1972-1974
optimization theory, theory of large systems
full professor, Dr of Technical Sciences
state award: individual; second degree 1964
director, PAN Institute for Systems Research and director, Research Center for the Theory of Large Systems, Newelska St No 6, 01-441 Warsaw, tele 36-44-14
[address] Jan Skrzetuski St No 36a, 02-726 Warsaw

Ignacy MALECKI, born 18 November 1912
corresponding member 1954, regular member 1958; member, PAN Presidium 1961-1971, 1975-1980, deputy scientific secretary, PAN 1961-1968
acoustics and the study of the progress of human knowledge
full professor, Dr of Technical Sciences
Dr h.c.: Technical Univ of Budapest
honorary member of: Polish Acoustics Society, Spanish Acoustics Society, Acoustics Society of Latin America, Ultrasound Society of India Federation of European Acoustics Societies (FASE), vice president 1978--; International Commission on Acoustics (ICA), president 1966-1971; International Council of Scientific Unions (ISCU), vice president 1962-1968
state awards: individual; third degree 1952, group; second-degree 1966
director, Institute for Basic Technical Problems, PAN, Swietokrzyska St No 21, 00-049 Warsaw, tele 26-89-11
Institute of Radio Technology, Warsaw Polytechnic, Nowowiejska St No 15/19, 00-665 Warsaw, tele 2-10-07 ext 644
[address] Asfaltowa St No 11 apt 12, 02-527 Warsaw

Maciej NALECZ, born 27 April 1922
corresponding member 1967, regular member 1973; member, PAN Presidium and secretary, Section IV--Technical Studies, PAN 1972-1980, deputy scientific secretary, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw, tele 26-89-51
electrotechnology, automatics, biomedical engineering
full professor, Dr of Technical Sciences
foreign member of: USSR Academy of Sciences
honorary member of: World Organization of Systems and Cybernetics
International Council of PUGWASH, president 1974--
state award: group; second degree 1972
director, PAN Institute for Biocybernetics and Biomedical Engineering and director, Research Center I for Biomeasurements and Biocontrol, Krajowa Rada Narodowa St No 55, 00-818 Warsaw, tele 20-64-38
[address] Pl Zamkowy [Zamkowa Sq] No 8 apt 2, 00-277 Warsaw

Witold NOWACKI, born 20 July 1911
corresponding member 1952, regular member 1956; member, PAN Presidium 1952--,
secretary, Section IV--Technical Sciences, PAN 1952-1957, deputy scientific
secretary, PAN 1957-1965, scientific secretary, PAN 1966-1968, PAN vice
president 1969-1977, PAN president 1978-1980
mechanics of continuous media
retired full professor, Warsaw Univ, Dr of Technical Sciences
Dr h.c.: Gdansk Polytechnic, Lodz Polytechnic, Poznan Polytechnic, Stockholm
Polytechnic, Warsaw Polytechnic, Univ of Glasgow, Univ of Grenoble, Univ of
Liege, Warsaw Univ
foreign member: Austrian Academy of Sciences, Bulgarian Academy of Sciences,
Czechoslovakian Academy of Sciences, Royal Society of Edinburgh
honorary member of: Gdansk Scientific Society, Polish Society for Theoretical
and Applied Mechanics, Slovak Society for Theoretical and Applied Mechanics
International Society for Cooperation in Mechanics and Mathematics (ISIMM),
president 1978--
state awards: individual; second degree 1949, individual; first degree 1955,
1964
[address] Wiejska St No 18 apt 8, 00-490 Warsaw

Bohdan PASZKOWSKI, born 28 March 1916
corresponding member 1965, regular member 1976
technical physics, electron technology, electronics
full professor
honorary member of: Polish Electricians Association
state awards: group; second degree 1968
director, Physics Institute, Warsaw Polytechnic, Koszykowa St No 75, 00-662
Warsaw tele 29-61-24
[address] Polna St No 54 apt 47, 00-644 Warsaw

Wladyslaw PELCZEWSKI, born 12 December 1917
corresponding member 1965, regular member 1980
automatics, theory of control
full professor, Dr of Technical Sciences
director, Automatics Institute, Lodz Polytechnic, Gdansk St No 176/178, 90-924
Lodz, tele 6-76-44
[address] Brzezna St No 12 apt 5, 90-303 Lodz

Tadeusz PELCZYNSKI, born 29 March 1906
corresponding member 1960, regular member 1969
plastics processing, research on the properties of materials
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
honorary member of: Association of Polish Engineers and Technicians-Mechanics
state award: group; second degree 1964
[address] Seweryn Goszczyński St No 18, 02-610 Warsaw

Jerzy Ignacy SKOWRONSKI, born 5 September 1901
corresponding member 1952, regular member 1964
high-voltage technology, electrotechnical science of materials
retired full professor, Wroclaw Polytechnic, Dr of Technical Studies
Dr h.c.: Wroclaw Polytechnic
honorary member of: Polish Society for Theoretical and Applied Electro-
technology, Polish Electricians Association, Wroclaw Scientific Society
[address] Wybrzeze Stanislawa Wyspianskiego [Stanislaw Wyspianski Coast] No 35
apt 4, 50-370 Wroclaw

Dionizy SMOLENSKI, born 6 October 1902
corresponding member 1964, regular member 1969; member, PAN Presidium 1969-1980,
PAN scientific secretary 1969-1971, PAN vice president 1972-1974
combustion theory
retired full professor, Warsaw Polytechnic
Dr h.c.: Warsaw Polytechnic, Wroclaw Polytechnic
honorary member of: Legnica Scientific Society, Plock Scientific Society,
Association of Chemical Industry Engineers and Technicians
state award: individual; second degree 1953
[address] Ludwik Warynski St No 9 apt 33, 00-655 Warsaw

Adam SMOLINSKI, born 1 October 1910
corresponding member 1962, regular member 1973
radio-electronics
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
International Union for Radio Sciences (URSI), vice president 1978--;
Polish Section of the Institute of Engineers, Electricians and Electronicians
of New York, president 1973-1979; Board of the European Microwave Conferences
vice chairman 1975, 1976, 1978
state award: group; second degree 1964
[address] Polna St No 54 apt 48, 00-644 Warsaw

Bogumil STANISZEWSKI, born 18 April 1924
corresponding member 1969, regular member 1980
thermodynamics
full professor, Dr of Technical Sciences
Director, Thermal Technology Institute, Warsaw Polytechnic, Nowowiejska St
No 25/29, 00-665 Warsaw, tele 2-10-07 ext 12-36
[address] Mokotowska St No 17 apt 13, 00-640 Warsaw

Robert SZEWALSKI, born 16 August 1903
corresponding member 1952, regular member 1961
energy machinery and equipment turbine technology
retired full professor, Gdansk Polytechnic, Dr of Technical Sciences
Dr h.c.: Gdansk Polytechnic
state award: individual; first degree 1980
[address] Stefan Batory St No 19, 80-251 Gdansk-Wrzeszcz

Pawel SZULKIN, born 29 August 1911
corresponding member 1952, regular member 1961; member, PAN Presidium and
deputy scientific secretary, PAN 1952-1957, 1961-1962
radiotechnology
full professor, Dr of Physical Sciences
foreign member of: Hungarian Academy of Sciences (honorary)
state award: group; second degree 1951, group; first degree 1953

Witold SZYMANOWSKI, born 6 May 1908
corresponding member 1952, regular member 1969; member, PAN Presidium and
secretary, Section IV--Technical Sciences, PAN 1966-1971
theory and structure of machine tools
full professor,(retired), Warsaw Polytechnic, Dr of Technical Sciences
state award: individual; second degree 1949
[address] Nowowiejska St No 22 apt 2, 00-665 Warsaw

Wojciech TRUSZKOWSKI, born 10 April 1921
corresponding member 1965, regular member 1980
physical metallurgy
full professor, Dr of Technical Sciences
honorary member of: French Metallurgy Society
director, Aleksander Krupkowski Institute for the Foundations of Metallurgy of
PAN, Wladyslaw Reymont St No 25, 30-059 Krakow, telephone 37-45-80
[address] Smolka St No 12b apt 5, 30-513 Krakow

Stefan WEGRZYN, born 20 May 1925
corresponding member 1964, regular member 1973; member, PAN Presidium 1969-1971,
1974-1980
computer science, theory of control
full professor, Dr of Technical Sciences, Dr of the Univ in Toulouse
Dr h.c.: Univ of Lille, Univ of Sherbrooke
state award: individual; second degree 1966, group; first degree 1976
director, Computer Science Institute for Real Time of Slask Polytechnic named
for Wincenty Pstrowski in Gliwice, Wincenty Pstrowski St No 16, 44-100 Gliwice,
tele 31-46-73
director, Research Center for Complex Automatic Systems, PAN, Baltycka St
No 5, 44-100 Gliwice tele 31-70-26
[address] Stanislaw Konarski St No 11 apt 3, 44-100 Gliwice

Jan ZACHWATOWICZ, born 4 March 1900
corresponding member 1952, regular member 1958
architecture and urban studies, history of architecture, preservation of
monuments
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
Dr h.c.: Technical Univ, Hanover
foreign member of: Academy of Architecture, Paris, Royal Institute of British
Architects
honorary member of: Association of Art Historians, Society for the Care of
Historical Monuments, Society of Polish Urbanists, French Association of
Architects-Preservationists, International Committee for Historical City
Centers, president 1970-1975
state award: group; first degree 1950
[address] Al. Roz [Blvd of Roses] No 8 apt 7a, 00-556 Warsaw

Tadeusz ZAGAJEWSKI, born 16 December 1912
corresponding member 1960, regular member 1976; vice president, PAN branch
in Katowice 1981--; Graniczna St No 42, 40-018 Katowice, tele 57-12-39
industrial electrotechnology
full professor, Dr of Technical Sciences
honorary member of: Polish Society for Theoretical and Applied Electrotechnology
director, Electronics Institute, Slask Polytechnic named for Wincenty Pstrowski
in Gliwice, Wincenty Pstrowski St No 16, 44-100 Gliwice tele 31-76-27
[address] Juliusz Slowacki St No 26 apt 4, 44-100 Gliwice

Piotr ZAREMBA, born 10 June 1910
corresponding member 1967, regular member 1976; vice president, PAN branch
in Gdansk 1981--; Jaskowa Dolina St No 31, 80-252 Gdansk, tele 41-73-78
urban studies and regional planning
retired full professor, Szczecin Polytechnic, Dr of Technical Sciences
[address] Stanislaw Wyspianski St No 27, 70-497 Szczecin

Stefan ZIEMBA, born 21 December 1907
corresponding member 1962, regular member 1969
theory of machine construction, mechanics
retired full professor, PAN Institute for Basic Technical Problems, Dr of
Technical Sciences
Dr h.c.: Bratislava Polytechnic, AGH Krakow, Poznan Polytechnic
[address] Etiuda Rewolucyjna St No 46 apt 10, 02-643 Warsaw

Corresponding Members

Ludwik BADIAN, born 4 August 1928
corresponding member 1976; scientific secretary, PAN branch in Wroclaw,
tele 44-48-13
electrotechnology and electronics of solid bodies
full professor, Dr of Technical Sciences
Institute for the Foundations of Electrotechnique and Electrotechnology of
Wroclaw Polytechnic, Grunwaldzka Square No 13, 50-372 Wroclaw, tele 22-97-25
[address] Pl Ludwika Hirszfelda [Ludwik Hirszfeld Sq] No 6 apt 6, 53-413 Wroclaw

Marceli BARAN, born 18 August 1921
corresponding member 1979
power systems and equipment
associate professor, Dr of Technical Sciences
state award: group; third degree 1955
director, Research Center for Boilers and Steam Generators, Mechanical-Power
Faculty of Slask Polytechnic named for Wincenty Pstrowski in Gliwice,
Stanislaw Konarski St No 20, 44-100 Gliwice, tele 91-72-51
[address] Jaskolcza St No 5, 44-100 Gliwice

Zbigniew BOJARSKI, born 21 August 1921
corresponding member 1973
crystallography, structure of metals
full professor, Dr of Technical Sciences
Director, Institute of the Physics and Chemistry of Metals and director,
Research Center for Crystallography and Structural Research of Slask Univ,
Bankowa St No 12, 40-007 Katowice, tele 59-69-29
[address] Drozdow St No 15b, 40-530 Katowice-Brynow

Zbigniew BRZOSKA, born 27 September 1916
corresponding member 1969

fundamentals of machinery construction, resistance of materials and structures
full professor, Dr of Technical Sciences

honorary member of: Polish Society of Theoretical and Applied Mechanics
director, Research Center for the Resistance of Materials and Structures,
Institute for Aviation Technology and Applied Mechanics of Warsaw Polytechnic,
Nowowiejska St No 24, 00-665 Warsaw, tele 21-007 ext 448
[address] Nowowiejska St No 22 apt 14, 00-665 Warsaw

Roman CIESIELSKI, born 4 November 1924
corresponding member 1971

theory of engineering structures, the dynamics of construction, experimental
studies of construction

full professor, Dr of Technical Sciences
rector, Krakow Polytechnic named for Tadeusz Kosciuszko, Warszawska St No 24
31-155 Krakow, tele 33-03-00 ext 201 and director of the Research Center
for Structural Analysis and Dynamics, tele ext 488
[address] Jozef Brodowicz St No 8 apt 5, 31-518 Krakow

Bohdan CISZEWSKI, born 23 December 1922

corresponding member 1973; member, PAN Presidium and secretary, Section IV--
Technical Sciences, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw
tele 20-33-03

materials engineering

full professor, Dr of Technical Sciences

honorary member of: International Institute for the Metallurgy of Powders (IISS)
Gen Jaroslaw Dabrowski Military Technical Academy, Bemowo, Warsaw, tele 36-94-46
[address] Swietojerska St No 24 apt 24, 00-202 Warsaw

Wladyslaw FINDEISEN, born 28 January 1926

corresponding member 1971

automatics, theory of control

full professor, Dr of Technical Sciences

state award: individual; second degree 1976

rector, Warsaw Polytechnic, Pl Jednosci Robotniczej [Worker Unity Sq] No 1,
00-661 Warsaw, tele 28-59-85

[address] Nowowiejska St No 22 apt 23, 00-665 Warsaw

Adam GIEREK, born 17 April 1938

corresponding member 1973

materials engineering

full professor, Dr of Technical Sciences

state awards: group; first degree 1972, 1976, 1980

director, Materials Technology Research Center, Institute for Materials
Engineering, Slask Polytechnic named for Wincenty Pstrowski in Gliwice,
Graniczna St No 16, 40-019 Katowice, tele 51-32-82 ext 12
[address] Drozdow St No 11d, 40-530 Katowice-Brynow

Witold GUTKOWSKI, born 13 September 1928
corresponding member 1976
mechanics of engineering and machine design
full professor, Dr of Technical Sciences
state award: group; second degree 1974
director, Laboratory for the Mechanics of Spatial Designs, PAN Institute for Basic Technical Problems, Swietokrzyska St No 21, 00-049 Warsaw, tele 26-12-81 ext 187
[address] Zygmunt Noskowski St No 12 apt 36, 02-746 Warsaw

Lech KOBYLINSKI, born 1 May 1923
corresponding member 1976
hydromechanics of ships
full professor, Dr of Technical Sciences
Gdansk Polytechnic Ship Institute, Włodzimierz Majakowski St No 11/12, 80-952 Gdansk, tele 47-14-80
[address] Piastowska St No 70d apt 6, 80-363 Gdańsk-Oliwa

Jan Kroszczynski, born 30 May 1927
corresponding member 1976
radiotechnology, radiolocation
full professor, Dr of Technical Sciences
state award: group; first degree 1964, 1974
director, Industrial Institute for Telecommunications, Warsaw, Poligonowa St No 30, tele 10-23-80
[address] Ludwik Narbutt St No 56 apt 5, 02-541 Warsaw

Mieczysław LUBINSKI, born 6 September 1921
corresponding member 1976
construction design
full professor, Dr of Technical Sciences
director, Interministerial Institute for the Construction of Warsaw Polytechnic, Al. Armii Ludowej [People's Army Blvd] No 16, 00-575 Warsaw, tele 21-59-03
[address] Koszykowa St No 75 apt 14, 00-662 Warsaw

Leon LUKASZEWCZ, born 20 November 1923
corresponding member 1976
electronics, computer science
full professor, Dr of Technical Sciences
International Federation for Data Processing (IFIP), vice president 1964-1968
state awards: group; second degree 1955, 1964
director, Programming Methods Section, PAN Institute for the Fundamentals of Computer Science, Palace of Culture and Science, 00-901 Warsaw, tele 20-02-11 ext 22-25
[address] Marszałkowska St No 10/16 apt 56, 00-590 Warsaw

Jan MADEJSKI, born 12 May 1925
corresponding member 1973
thermodynamics and heat transfer
associate professor, Dr of Technical Sciences
director, Thermodynamics Research Center, Aviation Institute, Rzeszow Polytechnic named for Ignacy Lukaszewicz, Wincenty Pol St No 2, 35-021 Rzeszow
[address] Bonifacy St No 83/85 apt 92, 02-945 Warsaw

Zdzislaw MARCINIAK, born 10 April 1918
corresponding member 1973
technology of the plastic working of metals
full professor, Dr of Technical Sciences
International Association for Deep Stamping (IDDRG), vice president 1977-1980
state award: group; first degree 1974, 1980
vice rector for academic affairs, Warsaw Polytechnic, Pl Jednosci Robotniczej No 1, 00-661 Warsaw, tele 28-00-50 and director, Plastics Working Research Center, Institute for Chipless Technologies, Ludwik Narbutt St No 85, 02-524 Warsaw, tele 49-94-37
[address] Szczesliwka St No 15 apt 45, 02-352 Warsaw

Wladzimierz PROSNAK, born 21 April 1925
corresponding member 1969; deputy scientific secretary, PAN branch in Gdansk 1981--; Jaskowa Dolina St No 31, 80-252 Gdansk, tele 41-73-78
fluid mechanics
full professor, Dr of Technical Sciences
director, Numerical Fluid Mechanics Laboratory, PAN Institute of Fluid Flow Machinery, Gen Jozef Fiszer St No 14, 80-952 Gdansk-Wrzeszcz, tele 41-12-71 ext 136
[address] Helena Maruszarzowna St No 7a apt 12, Gdansk-Morena

Wladyslaw PTAK, born 17 April 1920
corresponding member 1969
theoretical foundations of metallurgical processes
full professor, Dr of Technical Sciences
state award: individual; second degree 1964
director, Metallurgical Processes Theory Research Center, Metallurgy Institute for Nonferrous Metals, AGH named for Stanislaw Staszic in Krakow, Adam Mickiewicz Blvd No 30, 30-059 Krakow, tele 33-81-00 ext 26-83
[address] Daniel Chodowiecki St No 5 apt 8, 30-065 Krakow

Witold ROSINSKI, born 10 February 1911
corresponding member 1971
electronics of semi-conductors
full professor, Dr of Technical Sciences
state awards: group; first degree 1955, group; second degree 1964
Scientific-Production Center for Electronic Materials, Konstruktorska St No 6, 02-673 Warsaw, tele 20-12-81 ext 186
[address] Zwanowiecka St No 124 apt 6, 04-843 Warsaw

Waclaw SAKWA, born 28 September 1918
corresponding member 1971; scientific secretary, PAN branch in Katowice
1975--; Graniczna St No 32, 40-018 Katowice, tele 57-12-49
cast iron founding, the solidification and crystallization of metals
full professor, Dr of Technical Sciences
honorary member of: Association of Polish Foundry Engineers
International Committee of Technical Foundry Associations (CIATF), vice
president 1973, president 1974--
state award: group; first degree 1972
director, Foundry Institute, Slask Polytechnic named for Wincenty Pstrowski
in Gliwice, Towarowa St No 1, 44-100 Gliwice, tele 31-60-31
[address] Karolinka St No 37, 44-100 Gliwice

Antoni SAWCZUK, born 16 January 1927
corresponding member 1969
mechanics of continuous mediums and theory of engineering design
full professor, Dr of Technical Sciences
Dr h.c.: National POlytechnical Institute of Grenoble
state award: group; second degree 1968
director, Research Center for the Mechanics of Continuous Mediums and Research
Center for the Theory of Design, PAN Institute for Basic Technical Problems,
Swietokrzyska St No 21, 00-049 Warsaw, tele 26-88-02
[address] Mikolaj Kopernik St No 8/18 apt 62, 00-367 Warsaw

Jerzy SEIDLER, born 6 September 1927
corresponding member 1969
theory of information and control
full professor, Dr of Technical Sciences
state award: individual; second degree 1972
director, Marine Systems Group, PAN Institute for the Foundations of Computer
Science, Palace of Culture and Science, 00-901 Warsaw, tele 20-28-73
[address] Mikolaj Gomolka St No 14, 80-279 Gdansk-Wrzeszcz

Jan SZARGUT, born 9 September 1923
corresponding member 1976
thermal technology
full professor, Dr of Technical Sciences
director, Thermal Technology Institute, Slask Polytechnic named for Wincenty
Pstrowski, Stanislaw Konarski St No 22, 44-100 Gliwice, tele 31-42-16
[address] Karolinka St No 13, 44-100 Gliwice

Wojciech SZCZEPINSKI, born 1 January 1924
corresponding member 1976
theory of plasticity and experimental mechanics
full professor, Dr of Technical Sciences
state award: group; second degree 1968
director, Laboratory for the Mechanics of Plastic Flow, Research Center for
the Mechanics of Continuous Mediums, PAN Institute for Basic Technical Problems,
Swietokrzyska St No 21, 00-049 Warsaw, tele 26-12-82 ext 205
[address] Lisowska St No 56 apt 2, 01-820 Warsaw

Tadeusz SLIWINSKI, born 5 June 1922
corresponding member 1976; deputy secretary, Section IV--Technical Sciences,
PAN 1981--; Palace of Culture and Science, 00-901 Warsaw, tele 26-29-96
electrical machinery
full professor, Dr of Technical Sciences
state award: group; first degree 1964, 1976
director, Research Center for Studies in Basic Electrotechnology, Machinery
Industry Ministry and PAN, Electrotechnology Institute, Mieczyslaw Pozaryski
St No 28, 04-703 Warsaw, tele 12-30-11
[address] Wladyslaw Reymont St No 17 apt 1, 05-420 Jozefow near Otwock

Alfred SWIT, born 1 December 1928
corresponding member 1976
electron technology, electronics of solid states
full professor, Dr of Technical Sciences
director, Microelectronics Research Center, Electron Technology Institute,
Warsaw Polytechnic, Koszykowa St No 75, 00-662 Warsaw, tele 2-10-07 ext 533
[address] Lwowska St No 7 apt 20, 00-660 Warsaw

Kazimierz WEJCHERT, born 14 March 1912
corresponding member 1979
architecture, urban studies
full professor, Dr of Technical Sciences
foreign member of: FRG German Academy of City Building and Territorial
Planning
state award: group; first degree 1964
Institute for Urban Studies and Territorial Planning, Warsaw Polytechnic,
Koszykowa St No 55, 00-659 Warsaw, tele 28-32-36
[address] Orezna St No 45, 02-938

Jozef WIECKOWSKI, born 12 May 1928
corresponding member 1973; member, PAN Presidium 1981, president, PAN branch
in Gdansk 1980--; Jaskowa Dolina St No 31, 80-252 Gdansk tele 41-73-78, 41-69-12
theoretical and applied mechanics
full professor, Dr of Technical Sciences
Ship Institute, Gdansk Polytechnic, Wlodzimierz Majakowski St No 11/12, 80-952
Gdansk-Wrzeszcz, tele 47-17-93
[address] Stanislaw Wyspianski St No 25 apt 36, 80-434 Gdansk-Wrzeszcz

Michal ZYCZKOWSKI, born 12 April 1930
corresponding member 1973
theory of plasticity, reology
full professor, Dr of Technical Sciences
dean, Faculty of Mechanics and director, Research Center for the Mechanics
of Deformed Bodies, Krakow Polytechnic named for Tadeusz Kosciuszko, Warsaw
St No 24, 31-155 Krakow, tele 33-03-00 ext 502
[address] Jerzy Zulawski St No 4 apt 4, 31-145 Krakow

Section V--Agricultural and Forestry Sciences

Regular Members

Stefan ALEXANDROWICZ, born 20 March 1904
corresponding member 1967, regular member 1973
household animal husbandry
retired full professor, Agricultural Academy [AR] in Poznan, Dr of Agricultural Sciences

Dr h.c.: AR Szczecin
state award: group; second degree 1964
[address] Grunwaldzka St No 101 apt 1, 60-313 Poznan

Kazimierz BORATYNSKI, born 30 July 1906
corresponding member 1964, regular member 1973
agricultural chemistry
retired full professor, AR in Wroclaw, Dr of Philosophy
Dr h.c.: AR Poznan
state award: group; second degree 1980
[address] Jan Kochanowski St No 57 apt 2, 51-602 Wroclaw

Bohdan DOBRZANSKI, born 3 March 1909
corresponding member 1960, regular member 1969; member, PAN Presidium 1966-1980, deputy scientific secretary, PAN 1969-1971, secretary, Section V--Agricultural and Forestry Sciences, PAN 1972-1977
physics of the soil
retired full professor, Main School for Rural Farming, AR in Warsaw
Dr of Agricultural Sciences
Dr h.c.: AR Lublin, UMCS Lublin
foreign member of: GDR Academy of Agricultural Sciences, Hungarian Academy of Sciences (honorary), USSR All-Soviet Academy of Agricultural Sciences named for V. I. Lenin
honorary member of: Lublin Scientific Society, Polish Soil Science Society, Association of Agricultural Engineers and Technologists, German Soil Science Society (FRG), USSR All-Soviet Society of Soil Experts
state awards: group; third degree 1950, group; first degree 1974
[address] Marszalkowska St No 84/92 apt 111, 00-514 Warsaw

Janusz HAMAN, born 29 June 1923
corresponding member 1969, regular member 1980; member, PAN Presidium and secretary, Section V--Agricultural and Forestry Sciences, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw, tele 20-33-71
mechanization of agriculture
full professor, Dr of Technical Sciences
honorary member of: Association of Polish Engineers-Mechanics, Scientific Society of Organizations and Management
[address] Orlowicz St No 6 apt 2, 00-414 Warsaw

Jan KIELANOWSKI, born 16 June 1910
corresponding member 1960, regular member 1971
animal nutrition
retired full professor, PAN Institute of Animal Physiology and Nutrition,
Dr of Agricultural Sciences
Dr h.c.: Univ of Humboldt, Berlin, Univ of Edinburgh
foreign member of: GDR Academy of Agricultural Sciences
[address] Opoczynska St No 4b, 02-526 Warsaw

Jozef KOCHMAN, born 14 December 1903
corresponding member 1954, regular member 1966
phytopathology, mycology
retired full professor, Main School of Rural Farming, AR in Warsaw, Dr of
Philosophy
[address] Rakowiecka No 8, 02-521 Warsaw

Jadwiga LEKCZYNSKA, born 30 June 1899
corresponding member 1952, regular member 1969
plant cultivation, plant protection
retired full professor, Institute for Plant Cultivation and Acclimation and
Main School of Rural Farming, Ar in Warsaw, Dr of Philosophy, Dr of Agricul-
tural Sciences
[address] Adam Mickiewicz St No 34/36 apt 54, 01-616 Warsaw

Anatol LISTOWSKI, born 15 October 1904
corresponding member 1952, regular member 1961; member, PAN Presidium 1957-
1971, secretary, Section V--Agricultural and Forestry Sciences, PAN 1958-
1965, vice president, PAN 1966-1968
plant cultivation
retired full professor, Institute for Cultivation, Fertilization and Soil
Science, Dr of Philosophy
foreign member of: GDR Academy of Agricultural Sciences
[address] Armia Ludowa [People's Army] St NO 8 apt 2, 31-537 Krakow

Tadeusz LITYNSKI, born 2 June 1901
corresponding member 1969, regular member 1976
agricultural chemistry
retired full professor, AR in Krakow
Dr of Philosophy
Dr h.c.: AR in Krakow
honorary member of: Polish Soil Science Society
[address] Jan Sobieski St No 5 apt 6, 31-136 Krakow

Ryszard MANTEUFFEL, born 13 August 1903
corresponding member 1965, regular member 1971, member, PAN Presidium 1972-
1980
economics and organization of farms
retired full professor, Main School of Rural Farming, AR in Warsaw, Dr of
Agricultural Sciences
Dr h.c.: Ar Poznan, AR Lublin
honorary member of: Scientific Society for Organization and Management,

International Association of Agricultural Economists
International Center for Scientific Labor Organization in Agriculture (CIOSTA),
president 1968-1970
[address] Słupecka St No 7 apt 16, 02-309 Warsaw

Karol Henryk MANKA, born 7 January 1915
corresponding member 1969, regular member 1980
phytopathology, in particular the diseases of forest trees and their environmental causes
Institute for Forest Protection, Ar in Poznan, Wojsko Polskie [Polish Army]
St No 71c, 60-625 Poznan, tele 22-49-01 ext 19
[address] Kujawska St No 1, 60-618 Poznan

Witold NIEWIADOMSKI, born 2 January 1911
regular member 1973
general field and crop cultivation, crop production
retired full professor, Agricultural-Technical Academy in Olsztyn, Dr of Agricultural Sciences
[address] Tadeusz Kościuszko St No 99 apt 3, 10-554 Olsztyn

Marian NUNBERG, born 8 September 1896
corresponding member 1958, regular member 1964; member, PAN Presidium 1963-1965
forest protection
retired full professor, Main School for Rural Farming, AR in Warsaw, Dr of Technical Sciences
Dr h.c.: SGGW [Main School for Rural Farming], Warsaw
honorary member of: Polish Entomological Society
state award: group; third degree 1952, group; second degree 1980
[address] Kielecka St No 46 apt 1, 02-530 Warsaw

Szczepan PIENIAZEK, born 27 December 1913
corresponding member 1952, regular member 1964; member, PAN Presidium, 1960--, secretary, Section V--Agricultural and Forestry Sciences, PAN 1966-1971, PAN vice president 1975-1980
fruit culture
full professor, Dr of Horticultural Sciences
Dr h.c.: AR Krakow
foreign member of: Bulgarian Academy of Agricultural Sciences, GDR Academy of Agricultural Sciences, Agricultural Academy of France (regular), V.I. Lenin All-Soviet Academy of Agricultural Sciences of the USSR
honorary member of: International Society of Horticultural Sciences, Polish Botanical Society
International Society of Horticultural Sciences, president, Fruit Culture Section 1962-1966, vice president 1966-1970, president 1970-1974; International Council for Scientific Unions (ICSU), chairman, Horticultural Section 1970--
state awards: individual; second degree 1950, group; first degree 1978
director, Fruit Culture Institute, Pomologiczna St No 18, 96-100 Skierniewice, tele 25-49
[address] Karowa St No 18a, apt 6, 00-324 Warsaw

Tadeusz RUEBENBAUER, born 12 January 1909
corresponding member 1962, regular member 1969
plant genetics and cultivation
retired full professor, AR in Krakow, Dr of Agricultural Sciences
Dr h.c.: AR Wroclaw
[address] Urzednicza St No 48 apt 9, 30-048 Krakow

Abdon STRYSZAK, born 30 December 1908
corresponding member 1960, regular member 1969
veterinary science, epizootiology
retired full professor SGGW, AR in Warsaw, Dr of Veterinary Medicine
Dr h.c.: Hanover Higher Veterinary School
honorary member of: Polish Veterinary Society
[address] Pl Konstytucji [Constitution Sq] No 6, apt 1, 00-550 Warsaw

Stanislaw TOLPA, born 3 November 1901
corresponding member 1967, regular member 1976
botany, peat science, especially the biology and biochemistry of peat
retired full professor, AR in Wroclaw, Dr of Philosophy
[address] Sudecka St No 124, 53-129 Wroclaw

Wladyslaw WEGOREK, born 16 February 1918
corresponding member 1967, regular member 1976; member, PAN Présidium 1981--, president, PAN Section in Poznan 1981--; Mielzynski St No 27/29, 61-725 Poznan, tele 5-06-71
plant protection, entomology
full professor, Dr of Zoological Sciences
honorary member of: All-Soviet Entomological Society of the USSR
state award: group; second degree 1978
director, Plant Protection Institute, Iwan Miczurin St NO 20, 00-318 Poznan, tele 67-90-21
[address] Jozef Sowinski St No 30/32 apt 6, 60-284 Poznan

Corresponding Members

Anatol BRZOZA, born 20 November 1917
corresponding member 1965
agricultural economics
retired full professor, Agricultural Economics Institute in Warsaw
Agricultural Affairs Committee, UN European Economic Commission, chairman 1965-1966
[address] Litewska St No 10 apt 10, 00-581 Warsaw

Eugeniusz DOMANSKI, born 15 November 1909
corresponding member 1971
animal physiology, endocrinology
retired full professor, PAN Institute of Animal Physiology and Nutrition, Dr of Veterinary Medicine
honorary member of: Polish Physiological Society, Czechoslovakian Endocrinological Society, Society of Endocrinology and Diseases of Metabolic Change in Clinical Medicine of the GDR
Mikolaj Kopernik St No 8/18 apt 29, 00-367 Warsaw

Henryk DUNIEC, born 23 June 1924

corresponding member 1976

animal husbandry

full professor, Dr of Agricultural-Forestry Sciences

director, Research Center for Hog Raising, Zootechnical Institute, Sary St No 2,
30-960, Krakow, tele 11-30-30 ext 213

[address] Zootechnical Institute 32-083 Balice near Krakow

Zbigniew GERTYCH, born 26 October 1922

corresponding member 1976; member, PAN Presidium and secretary, Section V--
Agricultural and Forestry Sciences, PAN 1978-1980, first deputy scientific
secretary, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw,
tele 20-49-10

fruit culture, agricultural engineering, agricultural economics

full professor, Dr of Agricultural Sciences

Dr h.c.: GDR Academy of Agricultural Sciences

Sejm vice marshal, PRL [Polish People's Republic]

[address] Pl Zamkowy [Castle Sq] No 8 apt 7, 00-277 Warsaw

Wieslaw GROCHOWSKI, born 23 January 1911

corresponding member 1971

forestry sciences, forest by-products

retired full professor, Forestry Research Institute, Dr of Forestry Sciences

[address] M. Mochnacki St No 21 apt 19, 02-041 Warsaw

Tadeusz KRZYMOWSKI, born 30 July 1927

corresponding member 1971; member, PAN Presidium 1975-1980, vice president,
PAN branch in Gdansk 1981--; Jaskowa Dolina St No 31, 80-252 Gdansk-Wrzeszcz,
tele 41-73-78

animal physiology

full professor Dr of Veterinary Sciences

director, Animal Physiology and Biochemistry Institute, Agricultural-Technical
Academy in Olsztyn, 10-957 Olsztyn-Kortowo block 37, tele 2-83-72
[address] Al. Warszawska [Warsaw Blvd] No 111 apt 2, 10-701 Olsztyn

Stanislaw NAWROCKI, born 20 November 1927

corresponding member 1973; member, PAN Presidium 1975-1980

technology of soil cultivation and methods of fertilization of light soils

full professor, Dr of Agricultural Sciences

foreign member of: V.I.Lenin All-Soviet Academy of Agricultural Sciences of
the USSR

director, Institute for Cultivation, Fertilization and Soil Sciences, 24-100
Pulawy, Osada Palacowa, tele 49-60

[address] Gleboka St No 9 apt 8, 24-100 Pulawy

Tadeusz NOWACKI, born 14 October 1918
corresponding member 1973
agricultural mechanization
full professor, Dr of Agricultural Engineering Sciences
state award: individual; second degree 1952
director, Research Center for Agricultural Mechanization, SGGW AR Institute
for Agricultural Mechanization, Nowoursynowska St No 166, 02-766 Warsaw,
tele 43-18-76
[address] Hoza St No 36 apt 38, 00-516 Warsaw

Antoni RUTKOWSKI, born 13 November 1920
corresponding member 1971
food chemistry and technology
full professor, Dr of Technical Sciences
honorary member of: Hungarian Scientific Society for the Food Industry
director, Food Technology Institute, SGGW AR, Grochowska St No 272, 03-849
Warsaw, tele 10-35-51
[address] Marszalkowska St No 9/15 apt 32, 00-626 Warsaw

Stanislaw STARZYCKI, born 3 June 1923
corresponding member 1979
genetics and plant cultivation
full professor, Dr of Agricultural Sciences
director, Plant Raising and Acclimation Institute and director, Radiobiology
Research Center, Radzikow, 05-870 Blonie, tele 55-25-75
[address] Marszalkowska St No 34/50 apt 53, 00-554 Warsaw

Marian TRUSZCZYNSKI, born 21 July 1929
corresponding member 1976
microbiology and epizootiology
full professor, Dr of Veterinary Medicine
Commission for Biological Preparations Standards (OIE) Paris, vice president
1973--
director, Veterinary Institute and director, Microbiology Research Center, ul.
Partyzantow [Partisans' St] No 57, 24-100 Pulawy, tele 32-70
[address] XX-lecia PRL [20th Anniversary of the PRL] St No 6 apt 18, 24-100
Pulawy

Tadeusz WOJTASZEK, born 15 December 1920
corresponding member 1976
chemical weed-killing
full professor, Dr of Agricultural Sciences
Dr h.c.: AR named for Timiriazev, Moscow
director, Institute for Fruit Production, AR named for Hugon Kollataj in Krakow,
Al 29 listopada [29 November Blvd] NO 48, 31-425 Krakow tele 11-13-00
[address] Urzednicza St No 56 apt 3, 30-040 Krakow

Saturnin ZAWADZKI, born 7 July 1923
corresponding member 1979; deputy secretary, Section V--Agric. and Forestry
Sciences, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw, tele 20-33-45
soil reclamation science
associate professor, Dr of Agricultural Sciences
director, Reclamation and Arable Lands Inst. branch, PKWN Al [PKWN Blvd] No 29,
20-612 Lublin, tele 2-26-41
[address] Al PKWN No 29 apt 5, 20-612 Lublin

Section VI--Medical Sciences

Zygmunt ALBERT, born 30 October 1908
corresponding member 1963, regular member 1969
pathological anatomy and experimental oncology
retired full professor, Medical Academy [AM] in Wroclaw, Dr of Medicine
honorary member of: Polish Society of Anatomical Pathologists, Polish
Society of Histochemists and Cytochemists
state award: group; first degree 1964
[address] Witold Wojtkiewicz St No 12, 51-639 Wroclaw

Dymitr ALEKSANDROW, born 24 August 1909
corresponding member 1965, regular member 1976
cardiology
full professor, Dr of Medicine
Dr h.c.: WAM [Military Medical Academy] Lodz
honorary member of: American Association of Cardiologists
chief internist of the Polish Army, Center for Postgraduate Training, WAM, ul.
Szaserow [Szaser St] No 128, 00-909 Warsaw, tele 10-58-43
[address] Wilcza St No 35/41 apt 18, 00-678 Warsaw

Boguslaw BOBRANSKI, born 10 May 1904
corresponding member 1960, regular member 1969
chemistry of medicines
retired full professor, AM in Wroclaw, Dr of Technical Sciences
Dr h.c.: AM Wroclaw
foreign member of: New York Academy of Sciences
honorary member of: Polish Chemical Society, Italian Society of Pharmaceutical
Sciences
state award: individual; third degree 1953
[address] Leon Wyczolkowski St No 12, 51-639 Wroclaw

Wiktor DEGA, born 7 December 1896
corresponding member 1962, regular member 1969; member, PAN Presidium 1963-1968
orthopedics and traumatology, rehabilitation
retired full professor, AM in Poznan, Dr of General Medical Sciences
Dr h.c.: AM Krakow, AM Lodz, AM Poznan, AM Wroclaw, AWF [Physical Education
Academy] Poznan, Univ of Halle-Wittenberg
foreign member of: American Academy of Orthopedic Surgeons, Academy of French
Surgeons
honorary president of: Polish Society for Battling Crippling Diseases
honorary member of: Polish Medical Society, Polish Orthopedic and Trauma-
tological Society, Polish Rheumatological Society, Society of Polish Surgeons,
Austrian Union of Orthopedists, German [GDR] Society of Orthopedic Surgeons,
U.S. Polish Medical Association, Society of Surgeons of France, GDR Society
of Rehabilitation, the orthopedic and traumatological societies of: Bulgaria,
Czechoslovakia, Finland, France, Yugoslavia, FRG, Hungary, USSR, Hungarian
Society for the Rehabilitation of the Disabled
state awards: individual; third degree 1951, individual; first degree 1968,
Special Award 1979
[address] Feliks Dzierzynski St No 135/137, 61-544 Poznan

Kornel GIBINSKI, born 7 September 1915
corresponding member 1965, regular member 1973; member, PAN Presidium 1975--
gastroenterology
full professor, Dr of Medicine
Dr h.c.: AM Poznan, AM Wroclaw
foreign member of: New York Academy of Sciences
honorary member of: Polish Medical Society, Czechoslovakian Society of
Gastroenterological Physicians named for Purkin, GDR Society of Gastro-
enterology
European Society for Gastroenterological Endoscopy, vice president 1980--
state award: individual; second degree 1970
director, Gastroenterology Clinic of Slask Medical Academy named for Ludwik
Warynski, ul. Medykow [Medyk St] NO 10, 40-752 Katowice, tele 52-77-80
[address] Aleksander Zawadzki St No 63a, 40-128 Katowice

Adam GRUCA, born 3 December 1893
corresponding member 1954, regular member 1966
orthopedic surgery
retired full professor, AM in Warsaw, Dr of General Medical Sciences
Dr h.c.: AM Warsaw
foreign member of: Surgical Academy, Paris, American Academy of Orthopedic
Surgeons
honorary member of: Polish Medical Society, Society of Polish Surgeons,
International Society of Orthopedic and Traumatological Surgeons, Society
of Orthopedic Surgeons of Mexico, Orthopedic Society of Latin American
Countries, the orthopedic and traumatological societies of: Bulgaria,
Czechoslovakia, France, Yugoslavia, USSR
International Society of Orthopedic and Traumatological Surgery (SICHOT),
vice president 1963-1966
state award: individual; second degree 1951
[address] Jaroslaw Dabrowski St No 43, 02-561 Warsaw

Jozef HANO, born 2 March 1906
corresponding member 1967, regular member 1976
pharmacology
retired full professor, PAN Institute of Pharmacology, Dr of Medical Sciences
honorary member of: Polish Pharmacological Society, Polish Physiological
Society
[address] Slawkowska St No 9 apt 2, 31-016 Krakow

Antoni HORST, born 4 June 1915
corresponding member 1969, regular member 1980
general pathology, human genetics
full professor, Dr of Medicine
honorary member of: Poznan Society of the Friends of Science
director of the PAN Research Center for Human Genetics, Heliodor Swiecicki
St No 6, 60-781 Poznan, tele 20-98-87
[address] Podhalanska St No 14, 60-615 Poznan

Wladyslaw JASINSKI, born 22 January 1916
corresponding member 1963, regular member 1971
nuclear medicine
full professor, Dr of Medicine
director, Independent Laboratory for Nuclear Medicine, Medical Center for Postgraduate Training, Marymoncka St No 99, 01-813 Warsaw, tele 34-12-37 ext 25
[address] Tamka St No 34a apt 4, 00-355 Warsaw

Tadeusz KORZYBSKI, born 4 June 1906
regular member 1973
biochemistry, antibiotics
retired full professor, PAN Institute of Biochemistry and Biophysics, Dr of General Medical Sciences
honorary member of: Polish Biochemical Society
state award: group; second degree 1950, group; first degree 1968
[address] Kielecka St No 28 apt 7, 02-530 Warsaw

Jan Karol KOSTRZEWSKI, born 2 December 1915
corresponding member 1967, regular member 1976; member, PAN Presidium 1969--, secretary Section VI--Medical Sciences, PAN 1972-1980, vice president, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw, tele 20-41-68
epidemiology
full professor, Dr of Medicine
Dr h.c.: WAM Lodz
foreign member of: National Academy of Medicine of France
honorary member of: Polish Society of Epidemiologists and Communicable Disease Specialists, Polish Medical Society, Polish Society of Pathologists, Polish Medical Association of the United States, Society of Epidemiologists and Infection Specialists named for Miechnik of the USSR
International Society of Epidemiologists, president 1977-1981; World Health Organization (WHO), vice president 1969-1970, chairman of the Executive Committee 1975-1976; International Commission for Endorsing the Eradication of Smallpox in India, Nepal and Butan, chairman 1977,...in Ethiopia and Countries of the African Horn, chairman 1979; World Commission for Endorsing the Eradication of Smallpox Worldwide, vice chairman 1978-1979; Worldwide Advisory Group for Expanded Inoculation Programs, chairman 1980--
[address] Al. Roz [Rose Blvd] No 10 apt 6, 00-556 Warsaw

Hugon KOWARZYK, born 10 December 1906
corresponding member 1958, regular member 1969; vice president, PAN branch in Wroclaw 1981--; Podwale St No 75, 50-449 Wroclaw, tele 44-48-13
general and experimental pathology
retired full professor, Ludwik Hirschfeld Institute for Immunology and Experimental Therapy, Dr of General Medical Sciences
Dr h.c.: AM Wroclaw
foreign member of: German Academy of Natural Sciences of Leopoldin
honorary member of: Polish Physiological Society, Czechoslovakian Medical Society named for Purkin, Permanent Organizing Committee of International Electrocardiological Congresses
state awards: individual; third degree 1950, group; first degree 1964
[address] Aleksander Orlowski St No 11, 51-636 Wroclaw

Tadeusz KRAWICZ, born 15 January 1910
corresponding member 1967, regular member 1980
oculistics
retired full professor, AM in Lublin, Dr of Medicine
Dr h.c.: AM Lublin, Medical Univ, Budapest
member of: New York International Ophthalmological Academy
foreign member of: German Academy of Natural Sciences of Leopoldin
honorary member of: American Institute of Barraqueria, Bulgarian Oculist Society, Polish Medical Association of the United States, Association of Oculist-Surgeons (SES), Society of German Oculists (GDR), Hungarian Oculist Society, All-Soviet Scientific Society of Ophthalmologists of the USSR
Association of Cryooculists (SC), president 1966-1970
state award: individual; first degree 1966
[address] Ogrodowa St No 6, 20-075 Lublin

Adam KUNICKI, born 3 July 1903
corresponding member 1965, regular member 1973
neurosurgery
retired full professor, PAN Center for Experimental and Clinical Medicine, Dr of General Medical Sciences
honorary member of: Association of Polish Neuropathologists, British Society of Neurosurgeons, Society of Neurosurgeons of the GDR, Society of Neurosurgeons of the United States, Society of Neurosurgeons of the USSR
World Federation of Neurosurgical Societies, vice president 1974-1977
[address] Wisniowa St No 59 apt 8a, 02-520 Warsaw

Wladzimierz KURYLOWICZ, born 26 September 1910
corresponding member 1964, regular member 1971
microbiology
retired full professor, State Research Center for Hygiene, Dr of Medicine
Dr h.c.: AM Krakow, Univ of Debreczyn, Univ of Liege, Univ of Lille, Univ of Oslo
foreign member of GDR Academy of Sciences, Academy of Medical Sciences of the USSR, Finnish Academy of Science and Literature, National Academy of Medicine of Brazil, National Academy of Medicine of France
honorary member of: Polish Medical Society, Society for Radiation Research of Japan, Italian Chemotherapy Society, Society of Epidemiologists, Microbiologists and Communicable Disease Specialists of the USSR, Pharmaceutical Society and Society for Applied Microbiology of Egypt, Microbiology Society and Society for Public Health of Hungary
International Associations of Microbiological Societies (IAMS), vice president 1978--
state awards: group; second degree 1950, group; first degree 1968
[address] Kielecka St No 30 apt 9, 02-530 Warsaw

Tadeusz ORLOWSKI, born 13 September 1917
corresponding member 1964, regular member 1971; member, PAN Presidium 1969-1980, secretary, Seciton VI--Medical Sciences, PAN 1969-1971, first deputy scientific secretary, PAN 1972-1980
nephrology, clinical transplantology, internal medicine
full professor, Dr of Medicine
foreign member of: Hungarian Academy of Sciences

honorary member of: Poznan Society of Friends of Science, GDR Nephrological Society

state award: group; second degree 1968

director, AM Transplantology Institute in Warsaw, Nowogrodzka St No 59, 02-006 Warsaw, tele 29-42-07

[address] Al Roz [Blvd of Roses] No 6 apt 13, 00-556 Warsaw

Ksawery ROWINSKI, born 17 November 1904

corresponding member 1963, regular member 1969; member, PAN Presidium 1963-1974, secretary Section VI--Medical Sciences, PAN 1963-1968

pediatric radiology

retired full professor AM in Warsaw, Dr of General Medical Sciences

Dr h.c.: AM Poznan

foreign member of: Academy of Medical Sciences of the USSR

honorary member of: Polish Medical Radiological Society, Polish Society for the History of Medicine, Polish Medical Society, European Society for Pediatric Radiology

European Society for Pediatric Radiology (SERP), president 1968-1969, World Health Organization expert in affairs of training medical and paramedical cadres 1955-1975

[address] ul. Sniadeckich [Sniadecki St] No 18 apt 5, 00-656 Warsaw

Stefan SLOPEK, born 1 December 1914

corresponding member 1965, regular member 1973; member, PAN Presidium 1972-1980

immunology

full professor, Dr of Medicine

Dr h.c.: AM Poznan, Slask AM, AM Wroclaw

honorary member of: Polish Immunological Society, Polish Society of Microbiologists

state awards: individual; second degree 1950, 1952, individual; first degree 1970

director, Ludwik Hirszfeld Institute for Immunology and Experimental Therapy, PAN, Czerska St No 12, 54-113 Wroclaw, tele 67-94-24

[address] Pl Muzealny [Museum Sq] No 5 apt 1, 50-035 Wroclaw

Corresponding Members

Wiktor BROSS, born 5 August 1903

corresponding member 1971

thorasurgery, cardiosurgery, transplantology

retired full professor, AM in Wroclaw, Dr of General Medical Sciences

Dr h.c.: AM Wroclaw, Univ of Wroclaw

foreign member of: German Academy of Natural Sciences of Leopoldin, New York Academy of Sciences

honorary member of: Czestochowa Medical Society, Polish Medical Society, Polish Society of Pediatric Surgeons, Society of Polish Surgeons, Medical Society of Wroclaw, Wroclaw Scientific Society, Polish Medical Association of the United States, GDR Society of Surgeons

International Society of Surgeons (SICH), national delegate 1954-1979, vice president of SICH congresses 1964, 1966, 1977

state award: individual; third degree 1952

[address] Drozdow St No 22, 40-530 Katowice-Brynow

Mieczyslaw CHORAZY, born 31 August 1925
corresponding member 1971; member, PAN Presidium 1981--
biochemistry and biology of tumors, molecular biology
associate professor, Dr of Medicine
honorary member of: Hungarian Oncological Society
director, Research Center for the Biology of Tumors in the Gliwice branch of
the Oncology Institute, Wybrzeze Czerwonej Armii [Red Army Coast] No 15, 44-100
Gliwice, tele 31-10-61
[address] Wybrzeze Czerwonej Armii No 15, 44-100 Gliwice

Kazimierz DUX, born 9 June 1915
corresponding member 1971
experimental oncology and endocrinology
full professor, Dr of Medicine
honorary member of: Polish Endocrinological Society
European Society for Cancer Research (EACR), vice president 1973-1979
state award: individual; third degree 1950
director, Research Center for the Biology of Tumors, Oncology Institute,
Wawelska St No 15, 00-973 Warsaw, tele 22-48-31 ext 292
[address] Kanie, Nadarzynska St No 4, 05-058 Otrebusy

Ryszard GRYGLEWSKI, born 4 August 1932
corresponding member 1979
pharmacology
full professor, Dr of Medicine
director, Pharmacology Research Center, Medical Academy named for Mikolaj
Copernik in Krakow, Grzegorzecka St No 16, 31-531 Krakow, tele 11-06-10
[address] Smolensk St No 41 apt 32, 30-112 Krakow

Boguslaw HALIKOWSKI, born 1 March 1914
corresponding member 1973
metabolism, genetics, child neurology
associate professor, Dr of Medicine
honorary member of: Argentinian Pediatric Society, Pediatric Society of the
Dominican Republic
director, Pediatrics Institute of the Pomeranian Medical Academy named for
Gen Karol Swierczewski, Pl Unii Lubelskiej [Union of Lublin Sq] No 1, 71-344
Szczecin, tele 7-73-01
[address] Zawadzki St No 59 apt 4, 71-246 Szczecin

Maria KOPEC, born 14 August 1919
corresponding member 1976
hematology, radiobiology
full professor, Dr of Medicine
honorary member of: Turkish Hematological Society
state award: group; first degree 1976
director, Research Center for Radiobiology and Health Protection of the
Institute for Nuclear Research, Dorodna St No 16, 03-195 Warsaw, tele 11-07-36
[address] Filtrowa St No 64 apt 17, 02-057

Jerzy MAJ, born 14 July 1922
corresponding member 1979
pharmacology
full professor, Dr of Pharmacology
honorary member of: Hungarian Pharmacological Society
director, PAN Pharmacology Institute and director, Pharmacology Research Center, Smetna St No 12, 31-343 Krakow, tele 37-48-93
[address] Nad Sudolem No 24 apt 10, 31-228 Krakow

Witold MICHALKIEWICZ, born 17 November 1914
corresponding member 1969; scientific secretary, PAN branch in Poznan 1981--;
Mielzynski St No 27/29, 61-725 Poznan, tele 5-06-71
full professor, Dr of Medicine
honorary member of: Polish Gynecological Society, Polish Medical Society,
societies of gynecology of: Yugoslavia, GDR, Romania, Italy
director, Institute of Gynecology and Obstetrics, AM in Poznan, Polna St No 33,
60-535 Poznan, tele 4-46-51
[address] Nowina St No 14G, 60-589 Poznan

Miroslaw MOSSAKOWSKI, born 23 September 1929
corresponding member 1973; member, PAN Presidium 1975--; secretary, Section VI--
Medical Sciences, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw
tele 20-33-32
neuropathology, neurology
full professor, Dr of Medical Sciences
foreign member of: Mexican Institute of Culture
honorary member of: Polish Society of Pathologists, GDR Society of German
Neuropathologists
European Federation of Neuropathological Societies, president 1980--;
International Society of Neuropathologists, vice president 1976-1980
director, PAN Center for Experimental and Clinical Medicine and director,
Neuropathology Group, Dworkowa St No 3, 00-748 Warsaw, tele 49-64-93, 49-79-82
[address] Polna St NO 54 apt 40, 00-644 Warsaw

Jan NIELUBOWICZ, born 28 October 1915
corresponding member 1969
surgery
full professor, Dr of Medicine
Dr h.c.: AM Poznan
foreign member of: Royal College of Surgeons of England
honorary member of: Society of Polish Surgeons, Polish Orthopedic and
Traumatological Society, Bulgarian Surgical Society, Polish Medical Association
of the United States, Society for Vascular Surgery of Great Britain and Ireland,
Society of Lombard Surgeons, Society of Surgeons of Lyon, Society of Surgeons
of the GDR, Society of Italian Surgeons, Society of Medicine and Natural
Sciences of Parma, All-Soviet Society of Surgeons of the USSR
European Society of Cardiac and Vascular Surgeons, vice president 1971-1976,
president 1976-1980; International Society of Surgery, vice president, Executive
Committee 1972-1976
state award: group; second degree 1964, 1968
rector, AM in Warsaw, Filtrowa St No 30, 00-611 Warsaw, tele 25-19-04 and
director, Institute of Surgery, Banach St NO 1a, 02-097 Warsaw, tele 23-02-91
[address] Francuska St No 49 apt 46, 03-905 Warsaw

Maksym NIKONOROW, born 19 August 1913
corresponding member 1969
food analysis and toxicology, hygiene
full professor, Dr of Pharmacology
director, Research Center for the Study of Food and Items for Consumption, State
Hygiene Research Center, Chocimska St No 24, 00-791 Warsaw, tele 49-74-36
[address] Marszalkowska St No 28 apt 168, 00-576 Warsaw

Adam NOWOSLAWSKI, born 30 April 1925
corresponding member 1976; deputy secretary Section VI--Medical Sciences, PAN
1981--; Palace of Culture and Science 00-901 Warsaw, tele 20-38-03
pathological anatomy
full professor, Dr of Medicine
state award: group; second degree 1966
director, Research Center for Immunopathology, State Hygiene Research Center,
Chocimska St NO 24, 00-791 Warsaw, tele 49-31-86
[address] A. Cieszkowski St No 3 apt 9, 01-636 Warsaw

Kazimierz OSTROWSKI, born 24 October 1921
corresponding member 1976;
histology
full professor, Dr of Medicine
honorary member of: Society for Electron Microscopy and Topochemistry of the
GDR, Hungarian Anatomical Society
director, Institute of Biostructure, AM in Warsaw and director, Histology and
Embriology Research Center, Chalubinski St No 5, 02-004 Warsaw, tele 29-52-82
[address] Marszalkowska St No 28 apt 80, 00-576 Warsaw

Witold RUDOWSKI, born 17 August 1918
corresponding member 1973; deputy secretary Section VI--Medical Sciences PAN
1975--; Palace of Culture and Science, 00-901 Warsaw, tele 20-91-11
general surgery and oncological surgery, transfusiology
full professor, Dr of Medicine
Dr h.c.: AM Poznan, AM Warsaw
foreign member of: Academy of Surgeons of Paris, American College of Surgeons,
Royal Colleges of Surgeons of England, Australia, Edinburgh, Ireland, Canada
honorary member of: Polish Medical Society, Society of Polish Surgeons,
Society of Hematologists and Transfusologists of Poland, Hungary and Bulgaria,
Association of Surgeons of India
International Federation of Surgeons Associations, president 1975-1978
state award: group; second degree 1972, 1978
director, Institute of Hematology, Chocimska St No 5, 00-957 Warsaw, tele 49-
85-06
[address] Armia Ludowa St No 17 apt 1, 00-632 Warsaw

Section VII--Earth Sciences and Mining Sciences

Regular Members

Andrzej BOLEWSKI, born 17 July 1906
corresponding member 1952, regular member 1976
mineralogy and petrography, mineral raw materials
retired full professor, Stanislaw Staszic Mining-Metallurgy Academy [AGH] in Krakow, Dr of Technical Sciences
honorary member of: Polish Mineralogical Society
[address] Radwanski St No 5, 30-073 Krakow

Edward CZETWERTYNSKI, born 28 June 1901
corresponding member 1952, regular member 1980
hydraulics, hydrology
retired full professor, Warsaw Polytechnic, Dr of Technical Sciences
[address] Wladimir Komarow St No 88 apt 83 bl. B, 02-507 Warsaw

Kazimierz DZIEWONSKI, born 10 July 1910
regular member 1976
geography of fruit culture, urban studies, regional planning
retired full professor, Institute of Geography and Territorial Management, PAN, Dr of Technical Sciences
honorary member of: Society of Polish City Planners
International Association for Regional Research (IRSA), vice chairman 1971-1973
[address] Al. Niepodleglosci [Niepodleglosc Blvd] No 156 apt 3, 02-554 Warsaw

Rajmund GALON, born 14 August 1906
corresponding member 1969, regular member 1980
physical geography, geomorphology
retired full professor, Mikolaj Kopernik Univ in Torun, Dr of Philosophy
foreign member of: German Academy of Natural Sciences of Leopoldin
honorary member of: Polish Geographical Society, Scientific Society in Torun,
GDR Geographical Society, Italian Geographical Society
International Union for Quaternary Research (INQUA), vice chairman, Coastlines Commission (1969-1977)
[address] Jozef I. Kraszewski St No 22 apt 20, 87-100 Torun

Zdzislaw KACZMAREK, born 7 August 1928
corresponding member 1969, regular member 1980; member, PAN Presidium 1971-1974, 1978--, deputy scientific secretary, PAN 1971, secretary, Section VII--Earth Sciences and Mining Sciences, PAN 1978-1980, scientific secretary, PAN 1981--; Palace of Culture and Science, 00-901 Warsaw, tele 20-33-80
full professor, Dr of Technical Sciences
honorary member of: Hungarian Hydrological Society
World Meteorological Organization (WMO), vice president, Hydrology Commission 1964-1968; International Commission for Water Supplies (IUGG), pres. 1975-1977
PAN Geophysics Institute, 00-973 Warsaw, Ludwik Pasteur St No 3, tele 22-17-45
[address] Al. Pierwszej Armii WP [First Army of the Polish Army Blvd] No 16 apt 51, 00-582 Warsaw

Mieczyslaw KLIMASZEWSKI, born 26 July 1908
corresponding member 1960, regular member 1971
physical geography, geomorphology, geology, quaternary studies
retired full professor, UJ, Dr of Philosophy
Dr h.c.: Alliance College, Cambridge [Springs, Pa], Univ of Bratislava,
Univ of Jena, Univ of Slask Katowice, Univ of Kiev, Univ of St Andrews, Univ
of Uppsala
foreign member of: Finnish Academy of Sciences and Literature, Yugoslavian
Academy of Sciences and Arts, Royal Swedish Academy of Sciences, German
Academy of Natural Sciences of Leopoldin, Saxon Academy of Sciences
honorary member of: Polish Geographical Society, Belgian Geological Society,
geographical societies of: Finland, Holland, Hungary, the USSR
International Geographical Union (IGU), chairman, Subcommission for
Geomorphological Mapmaking 1960-1968
[address] Stanislaw Wyspianski St No 3 apt 2, 30-035 Krakow

Stanislaw LESZCZYCKI, born 8 May 1907
corresponding member 1952, regular member 1964; member, PAN Presidium 1952-
1968, 1978-1980, deputy scientific secretary PAN 1952-1957
economic geography, territorial planning
retired full professor, Warsaw Univ and PAN Institute of Geography and
Territorial Development, Dr of Philosophy
Dr h.c.: AE [Economics Academy] Poznan, Univ of Prague
foreign member of: World Academy for HUmanistic and Exact Sciences, Cambridge,
United States
honorary member of: Polish Geogrpahical Society, Polish Meteorological and
Hydrological Society, Polish Tourist-Sightseeing Society, Society of Polish
City Planners, geographical societies of: Austria, Czechoslovakia, France,
Holland, Japan, Yugoslavia (Croatia, Serbia), GDR, Hungary, Italy (Florence,
Rome), Great Britain
International Geographical Union (IGU), vice president 1964-1968 and 1972-1976,
president 1968-1972
state award: group; second degree 1976
[address] Karowa St No 18a apt 11, 00-324 Warsaw

Jerzy LITWINISZYN, born 2 August 1914
corresponding member 1956, regular member 1966, member, PAN Presidium 1969--,
vice president PAN 1978--; Palace of Culture and Science, 00-901 Warsaw,
tele 20-41-68; president, PAN branch in Krakow 1981--; Slawkowska St No 17,
31-016 Krakow, tele 22-48-53
applied mechanics
full professor, Dr of Technical Sciences
Dr h.c.: AGH Krakow
state awards: group; second degree 1953, individual; first degree 1968
foreign member of: Mexican Academy of Engineers
director, PAN Institute for Strata Mechanics, Wladyslaw Reymont St No 27,
30-059 Krakow tele 7-28-82
[address] Stefan Jaracz St No 5 apt 9, 31-143 Krakow

Edward PASSENDORFER, born 13 January 1894
corresponding member 1960, regular member 1976
dynamic geology, stratigraphic geology
retired full professor, Warsaw Univ, Dr of Philosophy
honorary member of: Polish Geological Society, Polish Society of Naturalists
named for Mikolaj Kopernik
state award: individual; third degree 1955
[address] Rakowiecka St No 22a apt 22, 02-521 Warsaw

Stanislaw PAWLOWSKI, born 11 May 1910
regular member 1976
geology and exploratory geophysics
retired full professor, Geological Institute in Warsaw, Dr of Technical Sciences
state award: individual; first degree 1955, group; first degree 1976
[address] Rakowiecka No 4 apt 11, 02-519 Warsaw

Wladyslaw POZARYSKI, born 4 December 1910
corresponding member 1969, regular member 1976
micropaleontology, tectonics, oil geology
full professor, Dr of Geological Sciences
foreign member of: German Academy of Natural Sciences of Leopoldin
honorary member of: GDR Society of Geological Sciences
state award: individual; second degree 1955; group; second degree 1964
director, Geological Institute Laboratory, Rakowiecka St No 4, 02-519 Warsaw,
tele 49-97-33, 49-53-51 ext 360
[address] Marszalkowska St No 34/50 apt 2, 00-554 Warsaw

Stefan Zbigniew ROZYCKI, born 8 January 1906
corresponding member 1952, regular member 1969
mezozoic stratigraphy and quaternary geology
retired full professor, Warsaw Univ, Dr of Philosophy
state award: individual; second degree 1951, individual; first degree 1968
[address] Krakowskie Przedmiescie No 30 apt 4, 00-325 Warsaw

Kazimierz SMULIKOWSKI, born 15 September 1900
corresponding member 1956, regular member 1966
petrography and mineralogy
retired full professor, Warsaw Univ, Dr of Philosophy
honorary member of: Polish Naturalists Society named for Mikolaj Kopernik
state award: individual; second degree 1951, individual; first degree 1970
[address] Konstanty I. Galczynski St No 3 apt 11, 00-362 Warsaw

Roman TEISSEYRE, born 11 April 1929
corresponding member 1969, regular member 1980; member, PAN Presidium and
secretary Section VII--Earth Sciences and Mining Sciences, PAN 1981--; Palace
of Culture and Science, 00-901 Warsaw, tele 20-01-11 ext 20-95
geophysics, seismology
full professor, Dr of Mathematical-Physical Sciences
foreign member of: Finnish Academy of Science and Literature
European Seismological Commission, chairman 1976-1978
deputy director for academic affairs, Geophysics Institute PAN, Pasteur St
No 3, 00-973 Warsaw, tele 22-53-43

director, Research Center for the Physics of the Lithosphere, Geophysics Institute, Warsaw Univ, Pasteur St No 7, 02-093 Warsaw, tele 22-74-17
[address] Filtrowa St No 62 apt 26, 02-057 Warsaw

Corresponding Members

Henryk BYSTRON, born 20 October 1920
corresponding member 1976; deputy scientific secretary, PAN branch in Katowice, 1981--; Graniczna St No 32, 40-018 Katowice, tele 57-12-49
mining aerology
associate professor, Dr of Technical Sciences
state awards: individual; third degree 1955, group; second degree 1972
deputy director, Institute for Mine Safety. Katowice, Main Institute of Mining, ul Armii Czerwonej [Red Army St] No 83, 40-161 Katowice, tele 59-21-82
[address] Gustaw Morcinek St No 3a apt 20, 40-124 Katowice

Czeslaw DRUET, born 29 March 1926
corresponding member 1979; scientific secretary, PAN branch in Gdansk 1980--;
Jaskowa Dolina No 31, 80-252, Gdansk-Wrzeszcz, tele 41-73-78
hydrodynamics of free-surface water reservoirs
full professor, Dr of Technical Sciences
Intergovernmental Oceanographic Commission of UNESCO, vice president 1977--;
International Oceanological Center of CEMA Member-Countries, chairman,
Scientific-Technical Council 1976-1979
state award: group; first degree 1976
director, PAN Research Center for Oceanology, ul. Powstancow Warszawy [Members of Warsaw Uprising St] No 55, 81-711 Sopot, tele 51-13-49
[address] Krolowa Jadwiga St No 7 apt 2, 81-765 Sopot

Stanislaw DZULYNSKI, born 27 August 1924
corresponding member 1973
geology
full professor, Dr of Philosophy
PAN Research Center for Geological Sciences, Senacka St No 3, 31-002 Krakow, tele 22-41-22
[address] Winiarski St No 10 apt 18, 30-063 Krakow

Alfred JAHN, born 22 April 1915
corresponding member 1971; member, PAN Presidium 1981--
physical geography, geomorphology, quaternary geology
full professor, Dr of Philosophy
foreign member of: German Academy of Natural Sciences of Leopoldin
honorary member of: Polish Geographic Society
International Geographic Union (IGU), president, Commission for Research in Geomorphological Processes 1968-1976
state award: individual; third degree 1952
director, Geomorphology Research Center, Geographic Institute of the Univ named for Boleslaw Bierut, pl. Uniwersytecki [University Sq] No 1, 50-137 Wroclaw, tele 40-22-95
[address] Ludwik Puget St No 24, 51-628 Wroclaw

Antoni S. KLECKOWSKI, born 5 May 1922
corresponding member 1979; deputy scientific secretary, PAN branch in Krakow
1981--; Slawkowska St No 17, 31-016 Krakow, tele 22-48-53

hydrology

full professor, Dr of Geological Sciences

rector, AGH in Krakow, Al. Adama Mickiewicza [Adam Mickiewicz Blvd] No 30,
30-059 Krakow, tele 33-49-98

director, Institute of Hydrogeology and Engineering Geology and director,
Research Center for the Dynamics of Subterranean Waters of AGH, Al. Mickiewicza
No 30, 30-059 Krakow, tele 33-47-62

[address] Grunwaldzka St No 21 apt 2, 31-524 Krakow

Stanislaw KNOTHE, born 2 February 1919

corresponding member 1976

mining, underground exploration

full professor, Dr of Technical Sciences

state award: group; second degree 1953

deputy director, Institute for Underground MIning and Work Safety, AGH, Al.
Adama Mickiewicza No 30, 30-059 Krakow, tele 33-81-00

[address] Daniel Chodowiecki St No 18 apt 3, 30-065 Krakow

Jerzy KOSTROWICKI, born 27 January 1918

corresponding member 1973

economic geography, geography of agriculture, utilization of the environment,
territorial development

full professor, Dr of Mathematical-Natural Sciences

Dr h.c.: Univ of Aix-Marseille

honorary member of: Croatian Geographic Society, Royal Geographic Society of
Great Britain, Serbian Geographic Society, Geographic Society of Bosnia and
Herzegovina, Geographic Society of the USSR

International Geogrpahic Union (IGU), vice president 1980--

director, PAN Institute of Geography and Territorial Development, Krakowskie
Przedmiescie No 30, 00-927 Warsaw, tele 26-19-31

[address] Julian Bartoszewicz St No 1a apt 8, 00-337 Warsaw

Zygmunt KOWALCZYK, born 29 May 1908

corresponding member 1971

geodesy, photogrammetry, mine surveying

retired full professor, Warsaw Polytechnic, Dr of Technical Sciences

state award: individual; second degree 1955

[address] Oktawia St No 1, 03-663 Warsaw

Jerzy NAWROCKI, born 20 December 1926

corresponding member 1979

mining, mine working

full professor, Dr of Technical Sciences

director, Institute for Mine Working, Slask Polytechnic named for Wincenty
Pstrowski, Wincenty Pstrowski St NO 2, 44-102 Gliwice, tele 31-36-60

[address] Kepowa St NO 22d, 40-583 Katowice

Roman NEY, born 18 February 1931
corresponding member 1976
geology of lodes, geotectonics
full professor, Dr of Technical Sciences
director, Energy Raw Materials Institute, AGH, Al Mickiewicza No 30, 30-059
Krakow, tele 33-65-04
[address] Daniel Chodowiecki St No 5 apt 13, 30-065 Krakow

Andrzej Z. SMOLARSKI, born 10 October 1927
corresponding member 1979
mechanics of formations, flow physics
associate professor, Dr of Technical Sciences
deputy director, Research Center for Flow Physics, PAN Institute for Strata
Mechanics, W. Reymont St NO 27, 30-059 Krakow, tele 37-42-00
[address] Julian Falat St NO 4/1 apt 14, 30-109 Krakow

Ludger SZKLARSKI, born 26 March 1912
corresponding member 1969
electrotechnology of mining
full professor, Dr of Technical Sciences
International Committee for the Automation of Mining (ICAMC), president 1973--
deputy director, Institute for the Automatics of Drive and Industrial
Equipment and director, Research Center for the Automatics of Mining Equipment
of AGH, Al Mickiewicza No 30, 30-059 Krakow, tele 33-81-00 ext 28-06
[address] Urzednicza St No 7 apt 1, 30-051 Krakow

Jerzy ZNOSKO, born 22 January 1922
corresponding member 1976
stratigraphy, tectonics, exploratory geology
associate professor, Dr of Geological Sciences
International Program for Geological Correlation (IGCP), vice chairman of
Project No 86
state award: individual; third degree 1955
Geological Institute, Rakowiecka St No 4, 02-519 Warsaw, tele 49-53-51 ext 440
[address] Pulawska St NO 7/9 apt 27, 02-515 Warsaw

Foreign Members

Section I--Social Sciences

Claude BACKVIS (1910), foreign member 1966, Slavic Studies
Bosveldweg 20, 1180 Brussels, Belgium

Giuliano BONFANTA (1904), foreign member 1980, linguistics
Via S. Carini 32, Rome 00152, Italy

Vittore BRANCA (1913), foreign member 1967, history of Italian literature
Fondazione Giorgio Cini, Isola di San Giorgio Maggiore, Venice, Italy

Fernand BRAUDEL (1902), foreign member 1962, history
59 rue Brillant-Savarin, 75013 Paris, France

Tigran Sergeyevich XACHATUROV (1906), foreign member 1977, economics
ul. Akademika Petrovskogo No 3 apt 30, 117 419 Moscow, USSR

Piotr Nikolayevich FEDOSEYEV (1908), foreign member 1974, philosophy
USSR Academy of Sciences, Leninskiy Prospekt No 14, 117-901 Moscow USSR

Eugenio GARIN (1909), foreign member 1974, philosophy, history of culture
28 via G. C. Vanini, 50129 Florence, Italy

Jean GAUDEMEL (1908), foreign member 1980, history of ancient law
14 Boulevard Jourdan, 75014 Paris, France

Ronald H. GRAVESON (1911), foreign member 1977, law
University of London, King's College, Strand London WC 2R 2LS Great Britain

Torsten HUSEN (1916), foreign member 1977, psychology, pedagogy
Institute of International Education, University of Stockholm
PO Box S-10405, Stockholm 50, Sweden

Radomir LUKIC (1914), foreign member 1977, law
Jugoslovenska Akademia Znatnosti i Umetnosti, Kucz Michaila
25 Belgrade, Socialist Federated Republic of Yugoslavia

Manfred MAYRHOFER (1926), foreign member 1977, linguistics
Institut fur Sprachwissenschaft der Universitat Wien, A-1010
Vienna, Dr. Karl Lueger-Ring 1, Austria

Reinhold OLESCH (1910), foreign member 1980, Slavic studies
D 5040 Brühl 6, Buchenweg 9, FRG

Louis ROBERT (1904), foreign member 1970, epigraphy, ancient history
31 Ave. Rene Coty, 75014 Paris France

Boris Aleksandrovich RYBAKOV (1908), foreign member 1970, archeology, history
USSR Academy of Sciences, Leninskiy Prospekt No 13, 117-071, Moscow, USSR

Torgny SAVE-SODERBERGH (1914), foreign member 1980, egyptology
Kyrkogardsgatan 27, 752 35 Uppsala, Sweden

Heinrich SCHEEL (1915), foreign member 1977, history
Deutsche Akademie der Wissenschaften der DDR, Otto-Huschke-Str. 22/23
108 Berlin GDR

Jean STOETZEL (1910), foreign member 1980, sociology and social psychology
9 rue Casimir Perier, 75007 Paris France

Mikhail Solomonovich STROGOVICH (1894), foreign member 1959, law
Institute of the State and the Law, USSR Academy of Sciences, Moscow
G-19, Frunze St No 10, USSR

Imre SZABO (1912), foreign member 1962, law
Budapest II, Ermelleki u. 14, Hungarian People's Republic

Bazaryn SHIRENDYB (1912), foreign member 1974, history, sociology, Academy of Sciences of the Mongolian People's Republic [MRL], Ulan Bator, MRL

Section II--Biological Sciences

Aleksandr Aleksandrovich BAYEV (1903), foreign member 1977, molecular biology USSR Academy of Sciences, Leninskiy Prospekt No 14, 117-901 Moscow, USSR

Bionizy BLASCOVIC (1913), foreign member 1977, microbiology Slovenska AKademie Vied, Mlynska Dolina No 1, 809-39 Bratislava Czechoslovakian Socialist Republic [CSSR]

Nikolay Petrovich DUBININ (1907), foreign member 1974, genetics Leninskiy Prospekt No 69, apt 366, korp. 3 Moscow, USSR

Vladimir Aleksandrovich ENGELHARDT (1894), foreign member 1974, biochemistry USSR Academy of Sciences, Leninskiy Prospekt No 14, 117-901 Moscow USSR

Severo OCHOA (1905), foreign member 1967, biochemistry New York University Medical Center, New York 550 First Ave, N.Y. 10016

Bohumir ROSICKY (1927), foreign member 1980, parasitology Ceskoslovenska Akademie Ved, Flemingovo 2, Prague 6, CRS

Dawid SHUGAR (1915), foreign member (Canada) 1980, biochemistry PAN Institute of Biochemistry and Biophysics, Rakowiecka St No 36, 02-532 Warsaw

Sergey Evgenievich SEVERIN (1901), foreign member 1970, medical and technical biochemistry Moscow University imeni Lomonosov 117-234 Moscow, USSR

Ferenc Bruno STRAUB (1914), foreign member 1967, biochemistry Magyar Tudomanyos Akademia, Szigony u. 43, 1083 Budapest, Hungarian People's Republic

Armen Leonovich TAXTADJAN (1919), foreign member 1977, botany Botanical Institute, USSR Academy of Sciences, Popova St No 2, 197 022 Leningrad, USSR

Charles Georges THIBAULT (1919), foreign member 1980, biology Centre National de la Recherche Scientifique 15, Quai Anatole France, 75-700 Paris, France

Alwyn WILLIAMS (1921), foreign member 1980, paleontology, zoology University of Glasgow, Glasgow, G 12 800, Scotland; Great Britain

Kunio YAGI (1919), foreign member 1980, biochemistry University of Nagoya, Japan

Section III--Mathematical, Physical and Chemical Sciences

Anatoly Petrovich ALEKSANDROV (1903), foreign member 1977, physics
USSR Academy of Sciences, Leninskiy Prospekt No 14, 117-901 Moscow USSR

Pavel Sergeyevich ALEKSANDROV (1896), foreign member 1959, mathematics
Moscow University imeni M. Lomonosov, korp. L apt 9, 117-234 Moscow, USSR

Nikolay Gennadevich BASOV (1922), foreign member 1977, theoretical and applied
physics
Physics Institute, USSR Academy of Sciences, Leninskiy Prospekt NO 53, Moscow
111-333, USSR

R.H.Bing (1914), foreign member 1980, mathematics, topology
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SATELLITE, AIRBORNE REMOTE SENSING DEVELOPMENT OUTLINED

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[Article by Bogdan Ney: "Satellite and Airborne Remote Sensing"]

[Text]

PRINCIPLES OF REMOTE SENSING

Remote sensing is based on remote detection, surveying and scanning of objects with the aid of electromagnetic waves. Electromagnetic waves emitted by objects and registered on an information carrier with the aid of a receiver (detector) allow to identify the features of these objects. Most remote sensing technology uses passive devices. The source of electromagnetic radiation in them is the sun. The objects emit a portion of the energy they receive from the sun; this emission continues even with a time delay (explaining why the radiation takes place even at night). Other so-called "active" method of remote sensing use their own sources of radiation. Different regions of the electromagnetic wavelengths are used in remote sensing. Along with visible light and various selected bands of this light, ultraviolet rays, photographic infrared waves and far-infrared or thermal radiation, as well as microwaves, are used. Fragments of radiation regions are reflected in such a way that the best imaging of various objects for their characteristics can be attained. In scanning aimed at recognizing numerous objects or diverse features of one object, several wavelength regions are used at the same time.

The physical components of remote sensing are the following: detector carriers, detectors (devices) for searching for information about objects, carriers of this information, devices assisting or replacing human operators in processing and interpretation of information, and playback of final information adapted to be used by the recipient of the scanning results.

*Abridged version of a paper presented at a session of the Seventh Section of the Polish Academy of Sciences on Oct 20, 1982. The presentation was illustrated by posters, maps and slides. For technical reasons, illustrations are not reproduced here.

Remote sensing is an interdisciplinary area of methodology. Primarily it is a tool of research or work used in various areas of science and practical activity. It also has its own peculiar research problems which make it a scientific or technical discipline in its own right. In this paper, remote sensing is discussed from the point of view of earth exploration, specifically the natural and artificial surface of the earth and lower layers of its atmosphere.

Principal Data Collection Techniques

The oldest data collection techniques used in aerial and satellite remote sensing come from conventional photography and photogrammetry. They use photographic equipment and photogrammetric cameras to search information and light-sensitive material as a carrier of images. Panchromatic and colored pictures or maps are final data carriers.

Multispectral cameras also belong to photographic techniques. They produce multispectral and spectral-band records, mainly using four to nine channels (radiation regions). For example, MKF-6 camera, a GDR and USSR design, has been used on satellites since 1976 (Soyuz 22); it has six channels for visible light and near-infrared radiation. One picture shot by this camera from a height of 265 km covers an earth terrain of 165 X 115 km. In Poland, we have Japanese multispectral NAC cameras. These use four spectral regions, including colors: blue, green, red and photographic infrared. For data collection in far-infrared or thermal regions, thermal and thermal profile cameras are used with television techniques (thermovation). Images played on a monitor can be fixed as black and white photographs (thermographs) and color compositions created on their basis. In Poland, some 20 thermal cameras are in use at various centers. Most common are devices manufactured by the Swedish firm AGA, featuring temperature resolution capacities of 0.2°C and basically independent of the distance. Among others, AGA cameras and thermoprofile equipment are installed at the remote sensing center [OPOLIS] at the Institute of Geodesy and Cartography [IGiK].

Multispectral scanners are electronic devices with line data selection (scanning) which use photocells, television imaging and electric signals. There are no such scanners in Poland.

In modern remote sensing systems on a satellite, the information carrier is magnetic tape; data registered on the tape can be transmitted to the receiving station on the ground. Magnetic tape data can be visualized--using special converters--in the form of images (photographs).

Radiometers serve to measure the radiation emitted by objects being scanned. They are important for calibration and testing in situ to identify so-called spectral characteristics of objects. Radiometers of other types are used on satellites. For example, on the US NOAA-6 satellite, there is a high-resolution radiometer (AVHRR).

Active radar technologies operate in microwave bands. These are independent of weather conditions. Radars are mainly used in meteorology. In exploration of the earth, they serve mainly for geologic (structural) studies, although with development of these techniques they become increasingly useful also for studies of the terrain surface. Data recorded in radar technology appear as signals from antennae in the form of outlines or images (video radars). Examples of radars are the Soviet TOROS system (used for aerial exploration of Southern Poland--some 100,000 km²--for geological purposes), the sideways looking airborne radar SLAR, synthetic SAR radar on Seasat satellites and SIR-A imaging radar on the space shuttle Columbia.

Levels of Earth Data Collection

Three levels of data collection can be distinguished in remote sensing in studies of the earth: satellite, aerial and ground.

The satellite level embraces altitudes from 200 km to 1000 km and currently produces pictures of the earth's surface in scales of 1:1-1:3.5 million. The terrain resolution capacity of images taken from this level currently is 20-80 m. The first pictures of the earth from a large distance were made in 1946 from ballistic missiles using photographic cameras. Since 1963, earth pictures have been shot by unmanned Soviet Kosmos satellites. The Molniya satellite in 1966 used television cameras. In 1965-66, American Gemini spacecraft made color photographs of the earth with scales of 1:3 million to 1:10 million from 200-700 km. In 1969, the US Apollo-9 spacecraft for the first time made use of multispectral (four-channel) cameras. In 1973-74, a great number of photographs (mainly of the territory of the US and North America) were produced from the Skylab orbiters. Since 1972, US remote sensing Landsat satellites have been operating. Since 1976, Soviet Soyuz and Salyut craft (altitudes of about 250 km) have been using multispectral MKF-6 cameras. The scales are 1:1 million to 1:2 million.

Weather satellites have been in orbit even longer, since 1960.

Airborne remote sensing is done at an altitude range of about 20 km. Airplanes, helicopters, balloons and even radio-controlled airplane models are used for this purpose. The first photographs from an anchored balloon were made in 1950-60. In Poland, pictures are taken from airplanes from an altitude of up to 4 km, with scales 1:2,000-1:25,000. The resolution of aerial photographs is about 20 cm to 2.5 m on the terrain.

Ground measurements are necessary for calibration (testing) of aerial and satellite pictures. Radiometers and spectrometers are used to measure in situ the so-called spectral response of different objects. The ground level is also used independently for exploration and application of thermal technologies.

The Principal Methods of Data Processing

In analog methods, man plays the main role. A specialist interprets (reads) the photographs and images, correlating the features of natural objects with their representations. The main feature of an image is its hue and color. Using the analog technique, over a dozen classes of objects are distinguished. The specialists make use of auxiliary equipment. Densitometers are used to measure the optical density of photographs. Stereoscopes and interpretoscopes are also applied. New devices are additive viewers that serve to make color compositions from various combinations of individual channels. Images are displayed on a monitor, from where they can be photographed. Artificial coloring is used quite commonly because of its higher "informativity" as compared to natural colors. Viewers also allow to collect automatically statistical data on identified objects. The OPOLiS-IGiK has such a viewer attached to electronic-analog converters made by the Japanese firm, NAC.

Digital (analytic) techniques limit the human role in image interpretation, replacing it with modern systems of remote sensing data conversion. The main elements of interactive data processing systems are: a converter allowing passage from an image to its magnetic tape record and vice versa; a computer-controlled device (operator keyboard, monitor) and output devices to print out the results or represent them in the form of drawing, photograph or map. The digital data processing is several times faster than the analog technique. Digital technology introduces geometric and radiometric corrections of images using a special program. With digital methods, various operations are feasible to extract data from images. These include such procedures as interchannel separation, image contrasting, image enhancement, composition from different channels (regions). For these operations, various mathematical functions are used, e.g., sine, polynomials and exponentials. For instance, the geological interpretation of satellite images of Krakow-Kielce region at the Geological Institute was carried out using sine contrasting.

The OPOLiS-IGiK uses the digital system supplied by the Canadian firm, OVAAC-Toronto. The system includes, among other things, a Photomation converter from Optronics and the PDP-11/34 computer from DEC. The system can identify 64 object classes.

Satellite Remote Sensing Systems for Earth Exploration

The current American satellite remote sensing system, based on unmanned Landsat satellites and a network of ground stations with automatic collection of data from satellites and presentation of this information on tapes and as images, operates on a commercial basis, supplying data to its clients. Recently, until 1982, the system used two satellites of the series--Landsat-2, launched in 1975, and Landsat-C, launched in 1978. The satellites move in circular orbits at an altitude of about 920 km, circling the earth 14 times every 24 hours; the equatorial shift of the orbits is 150 km, and every 18 days the satellite repeats its orbit. Landsat satellites view the earth's surface contained between 81° N lat and 81° S lat. The width of the viewing zone is 185 km, with the surface of each image being 34,000 km². Poland's territory

is covered by 24 images from eight orbits. Two satellites provide images of the same terrain every nine days, provided favorable weather conditions. Poland lies within the range of the ground data collection station in Fucino near Rome. Landsat satellites use four-channel scanners (green, red and two infrared bands), with a resolution of 79 m, as well as television scanners with a resolution of 79 m (Landsat-2) and 40 m (Landsat-C).

In the USSR, initially, Fragment-2 system was introduced, which was based on the Meteor-Priroda satellite and three ground stations. In contrast, manned Soyuz and Salyut spacecrafts do not constitute a permanent remote sensing system, but are used for specific exploration of the earth in the framework of particular flight programs. One picture from Salyut covers a terrain of 20,000 km². The resolution of these images is higher than that of Landsat.

Remote sensing technology is also used for other special purposes in weather and marine satellites (Meteosat, NOAA-6, and Seasat). Today, weather and telecommunication satellite networks are the best developed ones. From the point of view of their purpose, their most important advantage is immediate transmission of information.

Applications of Remote Sensing

In addition to meteorology, the following areas of remote sensing application and its main functions in individual areas are identified.

I. Geology and geomorphology: tectonic mapping, geomorphological mapping, discovery and location of mineral deposits and warm springs, either directly or indirectly based on photolineament analysis, geodynamic exploration (movement of tectonic plates, earthquakes, tectogenic surface movements), tentative siting of structures based on geologic-engineering features and glaciologic studies.

II. Hydrology and oceanography: water reserves and dynamics, location of subsurface water, studies of snow, ice and iceberg movement, bathymetrics studies of seashore dynamics, exploration of microscale sea currents, detection of schools of fish.

III. Use of territories and space planning: mapping of current use of territories, statistics of territory usage, investigation of dynamics of land usage, study of microclimate in terms of urban development, specific maps for earlier development planning, such as thermal maps of cities, environmental protection zoning.

IV. Exploration and monitoring of the geographical environment: Determination of range and intensity of industrial air and surface pollution, study of water purity in reservoirs and flows, studies of threats and damages to vegetation caused by biotic and technogenic factors.

V. Farming and forestry: soil mapping, soil moisture studies, soil erosion studies, monitoring vegetation, status of crops and fields and their biotic and industrial damage, functional land reclamation studies, statistics of agricultural land use, crop harvest forecasts, study of the sanitary state of forests--detection of biotic and industrial damage to tree stands, detection of forest fires.

VI. Mining and certain aspects of engineering: detection and location of fires in old coal workings and dumps, control of sulfur production by underground melting, studies of the effects of mining operations--strip and underground mining--on large territories, studies of heat loss in conduits and buildings, studies of thermal characteristics of industrial furnaces and rotary kilns.

Importantly, remote sensing is a new area undergoing intensive development so that its applications are expanding rapidly. On the other hand, it does not abolish other conventional exploration methods, but generally serves to supplement and support them. Direct on-site studies are indispensable in remote sensing for calibration of remote observations and control of their reliability. Satellite and aerial remote sensing are applicable mainly to studies of rapidly changing phenomena on large territories, where direct observations may be inadequate. Remote sensing simplifies the use of the exploratory principle "from general to specific," providing valuable premises on which to determine the particular ground sites for study. The economic effect of remote sensing applications can be illustrated by the spectral method of remote sensing developed at IGIK to investigate tree damage which allows sparing six out of seven damaged trees cut with conventional techniques.

Remote Sensing in Poland

Interpretation of photographs has been developing in Poland based on aerial photogrammetry for over 15 years. From the early 1970's, studies in thermovision were started at IGIK. Since Jan 1, 1976, a remote sensing center has been operating at IGIK; it serves research and application purposes and has the basic equipment for analog and digital data processing. A broad spectrum of specialties is represented on the OPOLIS-IGIK staff (photogrammetrists, geologists, geodesists, electronic engineers, physicists, computer scientists, etc.). A large proportion of the staff received training at major foreign research centers and are experienced in basic and applied research. Altogether, about 120-150 scientists are engaged in remote sensing research in Poland. They are representatives of 12 disciplines, working at universities, institutes of government ministries and the Polish Academy of Sciences, as well as at some enterprises and civil and military services. Elements of remote sensing have been included in educational programs in geodesy-mapping and geography. The Geodesy and Cartography Department of the Warsaw Polytechnic Institute offers an interdisciplinary graduate course which involves the use of IGIK staff and equipment. Remote sensing publications appear in various periodicals, most frequently in PRACY IGIK, FOTOINTERPRETACJA W GEOGRAFII and PRZEGLAD GEODEZYJNY. Of books on

remote sensing published in Poland to date, one can mention: A. Ciolkosz, J. Miszalski and J.R. Oledzki, "Interpretacja zdjęć lotniczych" [Interpretation of aerial photographs] (PWN, 1978); G. Rudowski, "Termowizja i jej zastosowanie" [Thermovision and its applications] (WKiL, 1978) and R. Kaczynski, S. Mroczek and J. Sanecki, "Rozpoznanie obrazowe" [Image recognition] (MON, 1982).

Up till now, IGIK has organized nationwide scientific symposia on remote sensing every two years. Specialists from foreign countries have also taken part in these workshops. The problems of remote sensing are discussed at national photointerpretation conferences organized by universities under the auspices of the Polish Geographical Society.

Aerial remote sensing photographs are produced by the State Geodetic-Cartographic Enterprise jointly with the Aerial Service Enterprises and the Topographic Services of the Polish Army in cooperation with the air force. Aerial photographs from higher altitudes are also made using equipment not available in Poland and obtained in the framework of the so-called subsatellite telephoto experiments conducted in selected regions of Poland under the Interkosmos program with the aid of Soviet AN-30 research aircraft. Photographs and magnetic tapes from Landsat satellites are collected at Fucino, Italy, ground station. Soviet satellite pictures of Polish territory are received under the contract signed by socialist nations. (Poland is represented by the Chief Administration for Geodesy and Cartography.) Also, these materials are received free of charge within the framework of the Interkosmos program.

In addition to Interkosmos, which includes a special remote sensing working group, international scientific and technical cooperation in this area is actively supported by Poland in the framework of geodetic and geologic services of socialist nations, within the framework of the UN (Committee for Peaceful Use of Outer Space, FAO and other agencies), and with nongovernmental international organizations (International Association for Photogrammetry and Remote Sensing, International Cartographic Association, International Astronautical Federation and the Committee on Space Research [COSPAR]). The remote sensing center of IGIK is linked by direct working contacts with its counterparts in Moscow, Budapest and Prague. Under the auspices of Polish and US ministries of agriculture, bilateral cooperation using remote sensing in forestry and farming is under way.

Poland's potential and experience in remote sensing enables it to provide expertise, education and perform specific projects for foreign clients. Specialists from IGIK have performed remote sensing studies from aircraft altitudes in Czechoslovakia, Hungary and Vietnam. IGIK and the Geological Institute, in a joint venture, have concluded the first contract for export in remote sensing signed by Geokart Export Enterprises and Polservice with Iraq's General Directorate of Geological Exploration.

A detailed review of remote sensing activities in Poland until 1981 is given in study by J. Bazynski, A. Ciolkosz, B. Ney and J. Walczewski, "Dowiadcznia Polski w wykorzystaniu teledetekcji do badań i ochrony

"zasobow naturalnych" [Polish experiences in applications of remote sensing for exploration and preservation of natural resources].

Research Problems in Remote Sensing

Three basic trends of scientific basic and applied research for remote sensing can be identified:

- 1) the methods, techniques and systems for data collection and transmission;
- 2) the methods, techniques and systems for data processing; and
- 3) methodological principles of interpreting remote sensing data for the needs of users.

Studies in these directions are conducted in Poland mainly as part of research program 06.7, "Development and Application of Space Research" (first level coordinator is the Center of Space Research of the PAN), where remote sensing is included in subproblem 4 (second level coordinator IGIK), as well as in Interkosmos and generally in remote sensing research worldwide. Because of the interdisciplinary nature of remote sensing, this research is conducted by scientists in various fields based on their particular results, mainly in basic research and design. Close links to practical applications are a characteristic trait of this research.

The first two research trends belong to technical and exact disciplines, particularly electronics, cybernetics and technical physics. Earth sciences are predominant in studies of the third trend, although with participation of physicists and computer scientists, as well as specialists in agriculture, forestry, biology, etc. Of specific problems investigated here, the following may be noted: the cause-effect relationships between characteristics of objects and natural phenomena and images of these features on remote sensing information carriers, establishing so-called interpretive keys based on studies of spectral characteristics of objects, theory of final errors of remote sensing data, taking into account the complete cycle: search-processing-interpretation, methods and techniques of specific interpretation of output data, information systems using remote sensing data and others, and methods and systems of environmental observation. Currently, Polish research in methodology of the principles of specialized remote sensing data interpretation is conducted in the following fields: geology, regional planning, environmental protection, water management, agriculture, forestry and marine technology. Since maps are the main form of presentation of remote sensing data, special cartography has a major place in this research.

Prospects of Further Development of Remote Sensing

The following tendencies in the development of remote sensing can be identified:

- 1) improved separation of remote sensing data to broaden the method's applications;

- 2) surmounting the influences of weather conditions by development of radar technologies, introduction of proper corrections, etc.;
- 3) speeding up the entire process from data interrogation to data use towards real time or minimum delay performance in relation to rapidly varying conditions (this has already been attained in space and weather communications);
- 4) development and operative implementation of automated satellite remote sensing systems;
- 5) development and operation of comprehensive remote sensing research programs for science and practical application; and
- 6) improved interpretation of remote sensing data to ensure reliability (high probability of correctness) and routine execution.

In the nearest future, an enhanced system of satellite remote sensing will be essential. In 1983, the next Landsat satellite, denoted by the symbol D, will be brought into full operation; it was launched in 1982 (elevation of about 700 km). Landsat-D is equipped, in addition to a four-region scanner, with the new seven-channel TM (thematic mapper) unit, which has two green channels, one red channel, three near-infrared or photographic, and one thermal infrared channel. The resolution capacity of the TM is 30 m on the ground. Landsat-D will transmit daily 750 images (scenes), including 500 from the scanner and 250 from the TM, compared with 190 images transmitted by Landsat-C.

The next important step will be the French remote sensing satellite SPOT (an orbit of about 830 km), to be launched in 1984 and brought into practical exploitation in 1985. The SPOT satellite will use a four-channel scanner with panchromatic ground resolution of 10 m, capable of producing a digital model of the terrain due to operation of practical stereoscopic effects. The remaining channels, complete with thermal infrared, will feature a resolution of 20 m.

In 1987, the European Space Agency (ESA) plans to put into orbit its ERS satellite for study of earth's reserves, equipped in addition with an altimetric unit for global monitoring of movements and pulsations of the earth's crust and the oceans.

Another factor is the development of Soviet remote sensing satellite system to be based on the Fragment experiment already in progress.

At the Second UN Conference on Exploration and Peaceful Uses of Space (Vienna, Sep 1982), the American agency, NASA, presented a comprehensive program of satellite study of human life on earth, including, among other things, such elements as demographics, environment, weather conditions, food reserves, etc.

The Geosat organization worked out and implemented a program entitled "Global Satellite Remote Sensing for Studies of Energy Minerals and Other Reserves," aimed specifically at oil, gas, uranium and copper prospecting

both on continents and under the seas. Participants in the program included American and French institutions, using existing and projected satellite systems such as Landsat, ERS, MOS (the Japanese satellite for marine research; planned launch in 1987).

The development of remote sensing is impossible without broad international cooperation. The above-mentioned Second UN Conference expressed this in its resolution, emphasizing peaceful uses of space, which belongs to all mankind, so that economic benefits of remote sensing contribute more than before to developing nations, and noted the role and forms of international cooperation in the UN framework and the forum of nongovernmental international organizations.

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